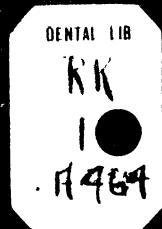
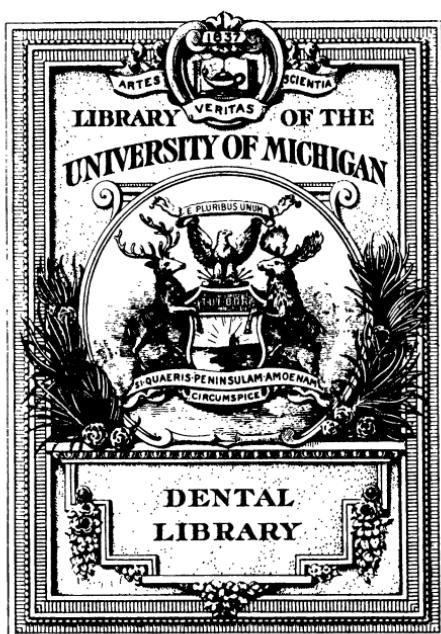


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Listerine Tooth Powder

Tooth powders have long been empirically employed, chiefly as a mechanical agent for cleansing the teeth, and with little regard to their composition or chemical action. Many of the articles sold for this purpose contain ingredients prone to fermentative action in the mouth, such as orris root, starch, sugar, etc., and, in addition, pumice stone, cuttlefish bone, or other harmfully abrasive substances.

Listerine Tooth Powder, possessing neither of these objectionable qualities, very acceptably meets all the requirements of a frictionary dentifrice, and promises to give much satisfaction to those who employ it, in conjunction with a mouth-wash of Listerine, suitably diluted.

To dental practitioners of record, the manufacturers will be pleased to send a supply of samples of Listerine Tooth Powder for distribution to patients.

**Lambert Pharmacal Co.
Saint Louis**

OUR POST GRADUATE COURSE

OPERATIVE DENTISTRY.

BY R. B. TULLER, D. D. S.

Wax Modeling for Inlays, Crowns, etc.

It is but a comparatively short time since Dr. W. H. Taggart introduced to the profession a thoroughly practical method of casting gold for dental purposes; the demonstration relating more particularly to gold inlays, but alluding to the possibilities in casting crowns, bridges and plate work. Owing to the simplicity of the process, though so new to the profession, it has been almost universally adopted for gold inlay work, and by many in crown and bridge work; though it soon developed that there were various other ways of forcing the gold into the mold than by using the very ingenious, elaborate and somewhat expensive apparatus or press invented by Dr. Taggart.

As soon as large gold inlays began to be produced, operators naturally began to study how the quantity of gold might be reduced without affecting the value of the inlay as a filling. It was readily seen that a considerable portion of the interior could be dispensed with, really improving the inlay since the conductivity could be reduced by cement filling the space when set in the tooth. This feature was much more important than mere saving of gold. To this end the gold was often bored out to some extent from the cavity side of the inlay, particularly at the point that immediately covered the pulp chamber. Sometimes the wax model was scooped out at that point; but that involved handling the model in a way to run risks of distorting it in the fingers or injuring some delicate margin.

It was left to Dr. F. E. Roach, who has invented many ingenious things for dentists, to devise a very unique way, together with an instrument for perfectly doing the work. It might be called a suction or vacuum wax carver. It is in the nature of a small syringe point,

heated to melt the wax while suction is produced to draw it into the point and deposit it in a chamber provided and filled with loose cotton. A heavy reinforcement or bulb a little distance back from the point, held over a flame, takes and holds heat enough to make the point as hot as required, and keep it so long enough to do what is required; while there is not heat enough to soften appreciably the model other than at the point of contact. As no force is employed in the operation, the wax may be held on the point of an instrument while any desired excavation can be made.

With such an instrument the inlay can be made a mere shell if desired; but of course good judgment must be used to not take away any wall or part that is essential to the fit and hold of the inlay in the tooth, nor to make it frail in any way. And again the chamber should not be made any larger than the opening into it, for the reason that the investment in filling this chamber is a projection in the mold and should not be frail enough at any point to be liable to be broken off and thus spoil the work. Hollowing out in a judicious way does not lessen the value of the inlay, but as before stated, is an improvement as regards the conductivity. No one is any better served by a solid gold inlay. Nothing is taken away from the real value by hollowing it, and in many cases it may be better held in the tooth.

Coming to cast crown work, several ways have been devised of making cast shell crowns that are far superior to those made of plate gold, especially for strong bridge abutments; one of the best, no doubt, was described in the last issue of the American, called the Dittman method. This begins by fitting a thin pure gold band to the root, or in fact making a complete crown, or thimble, it might be called. On this wax is built to take the bite and make the contour with gradually thickening walls from the gum line to the occlusal. Many a piece of bridge work has failed in a short time from having abutments of thin springing gold, shell crowns made of plate. It is well understood that if thick plate gold is used in making a crown it is not an easy matter to make it take closely the shape of the root. If it does it may still be springy when taking the strain a bridge is subjected to.

In the estimation of the writer a thin gold or platinum band should be accurately fitted to the root to be superimposed by, and to be part of, any cast gold crown. That is to say, the band, if soft enough

and made right, may be fitted to the root under the gum where it would be difficult and sometimes impossible to fit a wax shell model as perfectly, hence the cast would be likewise imperfect.

In making cast shell crowns, wax shells of various sizes may be secured, or may be quite easily made by dipping an oiled form (round polished wood, or brass pieces of rod) into the melted wax and chilling in cold water. Make a second dip if desired. To remove from the form prick a pin hole through the end to admit air and twist off. By warming slightly these shells may be modeled into the form of crown desired by using ball ended instruments to "bulge" out the sides to get a proper tooth form. The procedure is usually to take an impression and bite with the band in place on the root. Remove the band and fit it accurately in its place in the impression, and put a thin film of wax on the inside of band and proceed to pour plaster to make articulating models in the usual way. When plaster is hard warm the band and it may be easily removed. Clear it of the wax from inside and replace on the plaster model. This is done to insure its easy removal after the wax shell is fitted to it, so that it will come away with the latter when desired.

Now the wax shell is adjusted, sealed to the band with a warm instrument and the shell modelled to fit the space and make proper contact with adjoining teeth. In doing this the wax should be warm enough to be moderately pliable. Then when ready, chill, and then warm the occlusal only sufficiently to take the bite of the occluding teeth which is done of course by closing the articulator. With the articulator closed trim away surplus wax if any, attend to any modelling that should be done with teeth closed, then open and finish the modeling of cusps as may be indicated by the bite. With a bit of cotton and vaseline smooth and polish all surfaces just as the finished gold is desired, and see that the wax laps onto and adheres to the band, then chill and remove from the articulator and smooth the attachment to the band on the inside.

The model is now ready for investment and it should be mounted occlusally on the sprue wire selecting some cusp rather than the imprint of occluding teeth. Fill the inside first with the investing mix, avoiding bubbles, then proceed as usual. In casting, the flask should be pretty hot to insure the uniting of the gold to the band. The finished crown presents a thin true edge to pass under the gum with

gradually thickening and very rigid walls to and including the occlusal, and hence a crown much stronger than one made of plate, and especially desirable for bridge work.

In case it is desired to cast the bridge all in the one piece, the abutments are made as above and then wax dummies arranged properly between them. Dummies are sometimes hollowed out and after the cast is made a plate of thin gold is soldered on over the hollow to make a smooth surface. Dummies may be made of these wax shells by cutting away as desired for self cleansing space and contact with the gums. They may be solid or hollowed as above referred to. Of course this refers to all gold teeth. If porcelain facings are to be used, of course they have to be fitted in the course of wax construction. Some operators are using diatotic teeth, investing the teeth with the wax model, and casting directly onto them. Or pin teeth either straight or headed (rubber teeth) may be used. There seems to be little danger of checking if all is heated up extremely hot before casting, and then cooling very slowly. The trouble comes if in force of mastication the teeth break. Repair in such a case is difficult and usually requires removing the entire work. Replaceable teeth may be used and of course these do not go into the mold, but are set on with cement afterward. If such teeth break others may be very readily put in their places.

Straight pin facings may be made replaceable by oiling the backs and pins when adjusting in the wax; and when all is in readiness for their removal, they can be pulled off by heating the end of a stick of sticky wax and pressing on the facing. When cool enough, pulling on it, carefully and straight, brings the tooth. The holes left in the wax where the pins were, must now be filled with small pencil leads such as come with gold pencils, the same size as the tooth pin. These leads must be left projecting to some extent in order to be held firmly in the investment. When the piece is cast the leads remain in the gold and must be drilled out with a bur of the same size, which is easily done. The teeth then should go to place exactly as in the wax. Then when that is assured the pins should be threaded if one has a pin threader. If not, they may be slightly nicked with a sharp knife; or may be indented with cutting pliers, care being taken to not use force enough to cut off the pins nor cut deeply. This nicking is to

make a closer mechanical fit to the hole and supply a better hold for the cement with which they are to be set. It is then well to shorten the pins a trifle, to insure the tooth going tightly to place; otherwise the cement behind the pin in the hole may act to keep the facing off a very little.

If these teeth come off, which is not likely (unless they break), the same or another tooth of same size and mold may be put back with cement. If the facing breaks, the pins usually project and may be drawn out. If they break short they may be drilled out, so that the repair may be made without removing the bridge.

This use of replaceable teeth is delicate work, and the wax after removing the facings before casting presents many thin frail edges, hence without the most exacting care in putting the leads in the holes (which must be in tight enough to not drop out) and otherwise handling some part may be easily injured.

In using facings the wax should cover cervical end of the tooth to support it, and the cutting edge of these facings should also be covered as far as can be and not prevent withdrawing the facing when ready to invest. No overlapping the outer surface therefore will do. The facing in this respect is like an inlay that may be withdrawn and put back in the finished work.

Coming to cast plates, the grade of gold called clasp metal is generally used, because it is stiff and unyielding. 24, 22 and even 20 K. gold is not strong and stiff enough in many cases. Waxing up for a cast plate is practically the same as for rubber or for cast aluminum, if one is to cast directly to the teeth. If for rubber attachment the procedure is the same as for aluminum; or the cast plate may be same as a swaged plate, with a sufficient number of projections for rubber hold. The wax for cast plate must be pretty thin, else the plate will be too heavy. There is little occasion for a cast gold plate, except for partials, and then the wax work is much the same as for bridge work.

The casting of a root fitting of a pin crown, removable pin or otherwise, is very simple. Enough wax is put around the base and pin of the crown to be used to take a good impression of the end of root and often the interior of an opening enlarged by decay. This is warmed and pushed to place, then withdrawn, chilled and trimmed. If the pin is fixed in the crown, crown and all is invested. If removable, the porcelain is laid aside and the pin and wax invested mounted

on sprue wire, and a casting is made which fits both crown and root exactly.

Dr. R. C. Brophy has a method of using low fusing metal for this purpose equally as good as gold for single crowns; the casting may be done by the gravity of the metal, aided by jarring the flask, or it may be pushed in by a pad of asbestos. This is a great time saver, for any space or irregularity between crown and root is taken care of and the work is quickly done; and the joint is as perfect as can be secured. A crown so set, with good cement, is neither liable to come off nor to split the root as a loose fitting and loose pin in the canal is liable to do under strain. This way of fitting when complete is a near approach to the natural tooth.

(To be continued.)

TO COPPER ALUMINUM.

Dissolve 30 parts of copper sulphate, 30 parts of cream of tartar and 25 parts of soda in 1.000 parts of water. The objects to be copper plated should be immersed in this bath after having been previously thoroughly cleansed.—*Le Laboratoire et le Progres Dentaire Reunis*, Paris, October 25, 1908.

PRESERVATION OF TINCTURE IODIN.

In order to prevent the acid formation in alcoholic solutions of iodin, the addition of two parts of borax to one part of iodin is highly praised. This addition would have the power, even removing all traces of acid which could have formed in the solution. We all know that the action of this acid which is formed in the tinc. of iodin, is very injurious to the teguments where tinc. of iodin is applied, leading to desquamations and excoriations which are often very painful.

The new edition of the *French Codex*, which has been recently published, points out that in the future tinc. of iodin is prepared as follows: to the *tenth part* with 95° alcohol, whereas in the last edition of the Codex it was prepared to the *thirteenth part* with alcohol 90°, consequently the new tinc. of iodin is more active than the old one.—*Le Laboratoire et le Progres Dentaire Reunis*, Paris, October 25, 1908.

BACTERIOLOGY AND PATHOLOGY.

BY GEO. W. COOK, B. S., D. D. S., CHICAGO, ILL.

DEAN OF DENTAL DEPARTMENT, UNIVERSITY OF ILLINOIS; PROFESSOR OF BACTERIOLOGY, UNIVERSITY OF ILLINOIS.

The greater part of the foodstuffs which are ingested in animals can not be utilized as such directly, but must first be acted upon outside of the body as to be changed into a substance capable of trans-fusion through the animal membranes. In nearly all animals this change takes place in one or more of the body cavities; in man and all vertebrates it takes place in the intestinal tract. These changes are brought about through the agency of the various glandular structures which empty their products into the gastro-intestinal canal. The effects of these secretions on the foodstuffs is known as digestion. Chemically the action is one of transforming solid or semi-solid substances into the form of solutions. Before the animal body can utilize any foodstuff it must be in a diffusible form, that is, it must assume the liquid or gaseous form.

In the body this chemical transformation is effected by the saliva in the mouth, the gastric juice in the stomach, the pancreatic juice, the bile and the succus entericus in the intestines. The first act of digestion takes place in the mouth, and is accomplished by the teeth. It is purely a mechanical process of grinding and pulverizing the solid paste of the food. At the same time as this process of grinding and pulverizing is going on the foodstuffs are intimately mixed with the glandular secretions of the mouth, which dissolves certain of the food elements and renders the whole mass semi-solid so that it is easily passed on to the stomach.

The saliva is the secretory product of the salivary glands, viz., the parotid, the submaxillary and the sublingual glands, to which is added the secretions of the smaller mucous glands of the mouth cavity. It is a colorless, somewhat viscous fluid, inodorous, tasteless and opalescent, and has a specific gravity of 1.008-1.007. It is said to possess a slightly alkaline reaction, but this is doubtful. It is generally alkaline to litmus and acid to phenolphthalein (Stewart). Besides water and salts it contains mucin, which comes entirely from the submaxillary, the sublingual and the small mucous glands of the mouth. The viscosity of the mixed salivas is due to mucin. It

also contains small amounts of serum-albumin and serum-globulin, and a ferment-ptyalin.

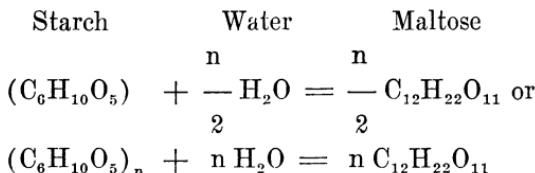
The salts are: Calcium carbonate, calcium phosphate, sodium bicarbonate, sodium chloride, potassium chloride, potassium sulphocyanide.

An analysis of the inorganic salts calculated for 1,000 parts by weight of mineral ash gives the following results:

	Parts.
Potassium	457.2
Sodium	59.9
Oxide of iron.....	50.11
Oxide of mag.....	1.55
Sulphuric acid (SO_3)	83.48
Phosphoric acid (P_2O_5).....	183.48
Chlorine (Cl).....	183.52

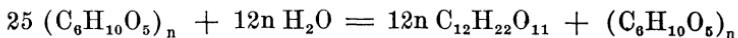
The qualities of these salts vary a good deal according to the condition of the individual, just as the constituents of the urine and other fluids of the body vary from time to time.

A great deal of carbon dioxide (CO_2) can be pumped out from the saliva, as much as 60 to 70 cc. from 100 cc. of the secretion. This is more than can be pumped from venous blood. A small quantity of oxygen (0.5 per cent volume) is also held in solution. The quantity of saliva secreted in 24 hours varies from 1,000 to 2,000 cc. Besides the function of moistening the crushed food for deglutition and dissolving sapid substances so as to allow them to excite the sensation of taste, etc., saliva, by virtue of its ferment-ptyalin, has the power to act chemically upon the starch of the food, converting it into maltose, after the following equation:

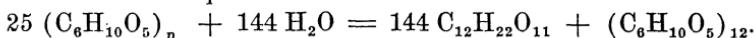


This reaction is never complete, that is, all the starch is not converted into maltose. The molecule of starch is not known, we only know that it is some multiple of the unknown of the group $\text{C}_6\text{H}_{10}\text{O}_5$, the unknown multiple being generally represented by n . In the most complete artificial ptyalin digestion about 4% of the starch is left

unchanged. The following equation represents the most complete ptyalin digestion of starch:



Let $n = 12$ the equation will stand as follows:



The $(\text{C}_6\text{H}_{10}\text{O}_5)_{12}$ is just 4% of $25 (\text{C}_6\text{H}_{10}\text{O}_5)_{12}$, and is unchanged starch.

This reaction of the conversion of starch to sugar is not confined to the animal body. Diastase, which is present in all sprouting seeds, forms maltose and dextrin from starches.

While a weak alkaline reaction is not unfavorable to salivary digestion, it goes on best in a slightly acid medium (Kübel). But an acid solution equal to 1% HCl stops it completely, and strong acids or alkalies permanently destroys it. Thus we see in the mouth where the reaction is neutral or only very weakly alkaline or acid, the conditions are comparatively favorable to the action of ptyalin. The conditions are still more favorable in the stomach for some time after the beginning of a meal, while the reaction is yet weakly acid. But during the greater part of gastric digestion the acidity in the stomach is too much for salivary digestion to continue. Salivary digestion in the mouth is very transient and consequently very incomplete. In fact it is hardly necessary to take it into consideration in a study of the mouth secretions in their relations to dentistry.

But what relation has the saliva to dental pathology? In the mouth the teeth are continually bathed in this fluid. Its functions seem to be, as already stated, a lubricant to the mouth so as to facilitate speech, to moisten the food so as to facilitate deglutition and to dissolve sapid substances so that they may excite the sensation of taste, and it is also a starch digester. Another function ascribed to saliva is the cleansing of the teeth after meals.

The saliva contains about 993 parts in 1,000 and mucin about 25 parts. The mucin gives the saliva its viscid, stringy character, and adds much to its lubricating qualities. On decomposition mucin yields laucin, tyrosin and other organic acids. These amido acids are also found among the decomposition products of all albumins. From this fact mucin can be considered as closely related to the albumins.

Leucin: $(CH_3)_2 \cdot CH_2 \cdot CH(NH_2)COOH$.

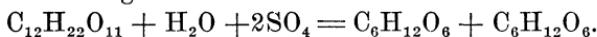
Tyrosin: $C_6H_4(OH) \cdot CH_2 \cdot CH(NH_2)COOH$.

In addition to water and mucin the already mentioned inorganic salts are held in solution, viz., calcium, carbonate and phosphate (often deposited as "tartar" around the teeth, and sometimes as salivary calculi in the glands and ducts), sodium bicarbonate, sodium and potassium chloride, and sometimes traces of potassium sulphocyanide. The total inorganic solids amount to about 6 parts per 1,000, or .6 of 1 per cent.

A careful consideration of the above chemical composition of the saliva is very important in the study of the teeth. There are no other organs of the body so often affected by disease as the teeth. In fact, no one escapes, and often before adult life is reached the teeth are in a state of decay. Modern pathology centers about bacteria as the most frequent disease stimuli; and modern therapeutics centers about antiseptic and germicidal measures as the most rational way to remove the cause of disease. In as far as our knowledge of pathology goes, all diseases of the teeth are caused by chemical changes which take place primarily in the normal environment of the teeth (saliva) and secondarily the products of salivary chemical change acting upon the tooth substance.

At the present day chemical change is centering more and more around the action of ferments or catalysts. By this we mean the chemical action induced by the presence of some element, the element itself not entering into the resulting formation. An example of this is well illustrated in the inversion of cane-sugar by an acid. When an aqueous solution of cane-sugar is treated with an acid it breaks down in the sense of the following equation:

Cane-sugar. • Glucose.



That is a molecule of cane-sugar takes up a molecule of water and breaks down into a molecule of glucose and a molecule of fructose. The acid does not enter into the reaction, and a very small quantity of H_2SO_4 can invert a very large quantity of cane-sugar. Many metallic substances have a similar action provided they are in a finely divided state. The action is termed "the surface action of metals." The first of these actions was noticed in connection with strong vegetable cells or bacteria, and were carefully studied by Pas-

teur and others. Hence the Pasteur theory of fermentation. He observed that on the addition of a few yeast cells to a dilute aqueous solution of grape sugar brought about the following reaction:



- (1) $\text{C}_6\text{H}_{12}\text{O}_6 + \text{H}_2\text{O} + \text{yeast} = 2 \text{C}_2\text{H}_5\text{OH} + 2 \text{CO}_2.$
- (2) $\text{C}_2\text{H}_5\text{OH} + \text{O}_2 = \text{CH}_3\text{COOH} + \text{H}_2\text{O}.$ Acetic acid.
- (3) $\text{C}_6\text{H}_{12}\text{O}_6 = 2 \text{CH}_3\text{CH}_2(\text{OH})\text{COOH}.$ Lactic acid.
- (4) $2\text{C}_3\text{H}_6\text{O}_3 = \text{C}_3\text{H}_6\text{COOH} + 2 \text{CO} + \text{H}.$ Butyric acid.

These equations illustrate a few of the carbohydrate decomposition products brought about by the presence of bacteria. Like chemical action is taking place all along the intestinal tract in man, and especially so in the mouth.

In the mouth we have an aqueous mucin solution holding in solution all the inorganic salts necessary for life. Bacteria of all kinds are continually being taken into the mouth and easily find a lodgment in the teeth and numerous recesses of the mouth cavity, and begin to act as fermenters in the saliva, which produces the following changes:

1. An oxidation of the mucoid-albuminous and carbohydrate constituents tending to the production of the amido-acids and fatty acids, viz., leucin, lactic, butyric and laevulinic acids.

2. A disarrangement of the inorganic ions whereby the calcium molecules are thrown out of solution in the form of CaCO_3 and $\text{PO}_4.$ This is due to the increased production of CO_2 and $\text{P}_2\text{O}_5.$ It is well known that if you pass your breath through an aqueous solution of $\text{CaO},$ or add a solution containing $\text{CO}_2,$ a saliva solution $\text{CaO},$ CaCO_3 is thrown out of solution. These lime deposits become mixed with the mucin and the saliva becomes what we call slimy. This readily deposits on the teeth in the form of "tartar." Put some saliva in a test tube and let it stand for some days and a slimy deposit of mucin and lime salts will settle to the bottom of the tube. In the mouth this slimy substance does not tend to deposit uniformly over the teeth, but only deposits the recesses and crevices, or places not in constant contact with the fresh flow of saliva. This creates a nucleus for the accumulation of bacteria in contact with the tooth substance, and a consequent fermentative action on the tooth, which accounts for the start of caries.

Caries of the teeth may be due to some specific organism, but it

is hardly probable that a specific organism acting chemically on the tooth substance could find a lodgement unless the already mentioned conditions were prepared for it. The same could be said of pyorrhea alveolaris, which undoubtedly is due to a specific cause. We cannot account for caries of the teeth on the theory of the formation of fatty acids by the action of bacteria are the carbohydrates of the food, viz., lactic acid, etc. These products are so soluble and diffusible that they could not accumulate in the mouth in sufficient quantity to cause a solution of the lime salts of the teeth, and if so their action would be uniform, affecting the whole exposed surface of the tooth. At any rate pathologists do not attribute caries of the bone to the formation of fatty acids in its close proximity, but to the action of certain pathogenic bacteria acting upon the bone. It would seem that if certain diseases of the teeth are due to specific micro-organisms such bacteria could be easily demonstrated. *Not so.* Recent studies into the morphology of bacteria have established the fact that cellular morphology is a very changeable property; that bacterial morphology depends upon environment, or the concentration of the albuminous salt solutions in which they grow. In fact nearly all the bacteria found in the mouth can be made to assume nearly all the morphological forms known to bacteria, according to concentration of the food media in which they grow. So morphology accounts for little, especially in bacteria from the mouth, where the concentration and chemistry of the saliva are continually changing. But if morphology is not trustworthy in determining the different kinds of bacteria, what is trustworthy, and what methods are we to follow in determining cause of disease?

1. A correct determination of the chemical constituents of the saliva and the chemical relation to each other.
2. A study of the fermentative changes in the saliva induced by the presence of bacteria.
3. The influence of these fermentative changes are the further growth and chemical action of bacteria.
4. The formation of mucin in organic deposits by bacteria.
5. Influence of the electrolytes, K. Na, Ca, Cl, SO₃, P₂O₅, etc., held in solution on the teeth and especially upon metal fillings.
6. Bacteria and their relation to caries, pyorrhea alveolaris, etc.
(To be continued.)

Our Foreign Department

THOMAS L. LARSENNEUR, D. D. S., Foreign Department Editor

THE CAUSE AND PREVENTION OF DENTAL CARIES.

BY DR. HARRY CAMPBELL.

(*The British Journal of Dental Science*, London, November 2, 1908.)

There have of late years been many discussions on the causation of caries and other diseases of the teeth. These discussions have elicited a great deal of speculation and learned talk, but, strangely enough, have almost entirely left out of consideration the central and very important practical fact that nine-tenths of the diseases of the teeth are due to a faulty system dieting. It is because Dr. J. Sim Wallace in his valuable paper to *The Lancet*, of September 12th, recognizes this truth, which has long been apparent to me from my researches into the evolution of man's diet, that I welcome it. The means of securing and preserving good teeth are simple in the extreme. May I be permitted, by way of emphasizing Dr. Wallace's position, to state what I conceive them to be as simply and forcibly as I can?

The prevention of dental diseases is, I say, a matter almost entirely of diet. Without entering into the question of feeding during the first months of life, I may observe in passing that the correct feeding of the infant involves the rigorous exclusion of every form of patent food. When the child begins to cut his teeth we should at once begin, though very cautiously, to give solid food with which, obviously, the teeth are intended to cope, and which therefore their appearance indicates as now suited to the needs of the growing child. Solid food may be conveniently referred to under the following heads: (a) Starchy food; (b) Sugar; (c) Fruit; and (d) Animal food.

(a) Starchy food.—All, or almost all, the starchy food should during the first year of life be given in a form compelling mastication; this plan not only enables the jaws and teeth to be properly exercised, but allows much of the starch to be digested in the mouth. Starchy foods of the liquid, pappy, spongy, and pulaceous order are

to be avoided, the chief exception being the potato, which may be allowed in moderation. The best way to give starch—I entirely endorse Mr. Edmund Owen's remarks on this head—is in the form of well-baked bread crust, to which butter, dripping, or bacon fat may be added. Hard biscuit is also good, but nearly so good as the less brittle the bread-crust. Directly the lower incisors are cut the infant may nibble at a leathery crust occasionally, but not until the molars appear should starch be allowed in any quantity. When at, say the third year, the instinct to masticate has by these means been developed, softer starchy food, such as milk puddings or porridge, may be allowed in moderation, for mastication now being instinctive these will not be permitted to flood the stomach wholly undigested, and so to set up fermentative dyspepsia. Here let me add that the child even at this stage may be allowed as much green vegetables as it can digest.

(b) Sugar.—The supply of sugar should be meagre until the third or fourth year and when given concentrated it should be at, or immediately after, the regular meal times. Sugar-cane may, however, be allowed almost indiscriminately, not only because the contained sugar is in a diluted form, but also because cane chewing exercises the jaws in a very different manner.

(c) Fruit.—Directly the incisors are cut the infant may be allowed occasionally to bite at some hard fruit—e. g., an apple, and as the child gets older other fruits may be added to the dietary.

(d) Animal food.—This may be given in any form in which it can be digested, for the young human is quite as carnivorous as vegetarian. Directly dribbling at the mouth heralds the eruptions of the teeth, the child should be given a chop bone or a chicken bone to gnaw *ad libitum*, and this practice should be encouraged until the end of the second year or later. It should be borne in mind that the fleshy parts of animal food, unless toughened by bad cooking, do not require mastication in the strict sense of the term. Butchers' meat should be underdone rather than overdone.

The effect of following these simple rules would be practically to do away with dental diseases in children and to effect an enormous reduction not only in dental, but in nasal, pharyngeal, aural, as well as many other diseases among non-civilized peoples, both in early life and later. About the truth of this bold assertion there cannot be the

slightest doubt in the mind of anyone who will look impartially at the facts of the case. What these facts are I have quite recently stated in my work "On Treatment," and there is no need for me to discuss them here in detail, but I may perhaps be permitted to restate a few of the chief.

I have shown (1) that from the antropoid period of his career right up to the time when he began to cook his food man became increasingly carnivorous, and that at the close of this period, at least one-half of his food (probably more) was of the animal kind. (2) Further, that until the discovery of cookery very little crude starch was permitted to enter the human stomach, but not only were the supplies of this substance comparatively slender in pre-cookery days, but these slender supplies were entangled in a cellulose mesh-work, which in almost every instance needed abundant mastication in order that the starch and other food-stuffs might be liberated, and thus rendered capable of digestion. This circumstance necessitated an active use of the jaws and teeth which tended to their healthy growth and development and at the same time facilitated the buccal digestion of the injected starch, whereby a considerable portion was converted into dextrines, and some indeed even into malt sugar, before it was permitted to enter the stomach. (3) That until the agricultural period (which long post-dated the discovery of cookery), man's only source of sugar, other than the limited supplies he obtained from fruit, etc., was wild honey.

Now let us glance at the present state of things. Not only has neo-agricultural man vastly increased his supplies of sugar, not only does he consume these substances in an amount vastly in excess of that consumed by his not very remote ancestors, but—and this is the point I chiefly wish to drive home—practically the whole of his starchy food is in a liquid, pappy, spongy, or pultaceous form; the stomach and bowels are, in fact, deluged with crude starch which has suffered little or no buccal digestion, while the jaws and teeth get little or no real work.

I have said that animal food does not need any mastication to speak of. It is essentially the starchy portions of our food which demand prolonged chewing. Yet there is scarcely a single article of vegetable food in the modern dietary which calls for more than a pretence at chewing. Of the more starchy foods of this country—potata-

toes (often mashed), bread (mostly new and with little well-baked crust), bread-and-milk, rusks soaked in milk, porridge, gruel, milk puddings (rice, tapioca, plum), cakes (seed, caraway, current), scones, buns, sponge-cakes, queen cakes, muffins, crumpets, pastry (in forms too numerous to mention), macaroni, blanc-mange, biscuits—only bread-crusts and biscuits tend to excite mastication; and they very insufficiently, for the crusts are often soft, and are, moreover, not rarely avoided, while the biscuits are generally of a kind which readily crumble between the teeth. The rest slide down into the stomach with fatal facility and afford little or no exercise for jaws, teeth, or salivary glands. Dietetically speaking, the present age may, indeed, be characterized as the "Age of Pap."

ARSENICAL NECROSIS OF THE MAXILLARY BONES AND ITS TREATMENT.

BY DR. HENTZE.

(*Berliner Zahnärztliche Halbmonatsschrift*, June 5, 1908.)

Light cases of poisoning by arsenic occur in every practice. If a pulpitic tooth has not been sufficiently isolated by rubber dam, if during the insertion of the arsenical paste the patient becomes restless and particles of the paste enter the mouth cavity, or if the temporary plug over an arsenical treatment becomes pervious, necrosis of the interdental papillae, hyperemia of the mucous membrane, a small ulcer on the tongue or the mucous membrane of the cheeks may result. These troubles generally quickly heal without special treatment. Arsenic poisoning becomes much more serious if the arsenical paste has been placed into a young permanent tooth having a not well developed root as in such cases the tooth is generally lost, and even necrosis of the alveolus may ensue. Dr. Hentze cites four cases of very serious arsenical poisoning caused by careless use of arsenical paste, in which luxation of the teeth, destruction or ulcers of the alveoli, and even necrosis of a great portion of the maxillary bone were the consequences. In all cases where arsenical poisoning is suspected the author first gathers the necrotic tissues, in order to determine their arsenious contents, which is done by heating the substance in a dry test tube after adding some carbon or potassium

cyanid; a mirror of metallic arsenic will appear. Another still better method is to pour sulphuric acid over the substance, stir it thoroughly, and mix fifteen minims of the acid with a solution of iodin in a test tube, until the whole takes a yellow color; then a few pieces of zinc are added. After inserting a stopper of loose cotton, the mouth of the test tube is covered with a sheet of white filter paper, the center of which has been moistened with a drop of concentrated solution of silver. If the moist spot becomes yellow immediately or after some time, or if the spot becomes brown or black at its periphery, arsenic is surely present.

The treatment is according to the severity of the poisoning. If arsenic comes into contact with the mucous membrane of the mouth, severe hyperemia immediately appears. Sometimes, if an arsenic tampon in a carious tooth is badly covered, total or partial hyperemia of the mucous membrane of the mouth occurs; we then notice a sort of inflammatory scurf, which mollifies and deliquesces. After the scurf has disappeared, smearable discolored masses of decayed tissues present themselves. The decay penetrated more deeply and gives off a disagreeable odor; by and by the maxillary bone is laid open and sequestra are discharged. The surroundings of such a necrotic tumor are reddened and extremely sensitive, as is also the bottom of the tumor, while the gangrenous parts are entirely insensitivie.

If we have to deal with simple hyperemia, frequent rinsing with calcined magnesia (5 parts to 150 parts of water) will be sufficient. If gangrene has already set in the surroundings of the tumor and the tumor itself must be painted with a 10 per cent solution of cocaine; all danger of cocaine poisoning is excluded, since inflamed or destroyed tissues are not resorbent. All necrotic parts are removed with a sharp spoon, and after scraping the wound is dressed with a tampon of isoform gauze. Isoform is to be preferred to iodoform on account of its better taste and smaller toxicity; pure powdered charcoal will sometimes give satisfactory results. If tamponede is impracticable, the surface is to be covered with powdered isoform and rinsed with physiologic salt solution. Washes with acrid antiseptics are to be avoided, as they interfere with granulation. Sequestra must be removed in time; if necessary the whole necrotic bone must be taken out.

Regarding the treatment of the teeth affected by this process it must be borne in mind that all teeth that have been in contact with

arsenic for some time become necrotic. It is therefore necessary to open the pulp chamber and to insert an antiseptic filling into the roots. Teeth that have become loosened through the formation of the sequestra must not be extracted, for it is surprising how such teeth, even after great losses of the alveoli, become firm again. In such cases the teeth affected must be splinted and protected against the pressure of the bite by a temporary raising of the articulation.

The careless application of arsenic involves very great dangers, such as pulsion diverticulum of the esophagus, serious nervous disturbances, discoloration of the skin and serious gastro-enteritis. One case of the last sort is cited from No. 1, 1907, of *Excepta Medica*. A nurse, subject to anemia, had some arsenious paste inserted in the cavity of a tooth. During the first night after insertion she vomited, complaining of severe pains in the stomach. The next day her condition became worse, the skin was cold and pale, respiration difficult, spasmodic condition in the arms and legs, pulse weak, fast and irregular. Anamnesia and symptoms suggested acute arsenious poisoning, and the filling was removed. The cavity was only half filled with arsenious paste, which showed that the temporary filling had become pervious and that part of the paste had been swallowed. Since rinsing of the stomach was not indicated, on account of nausea and respiratory troubles, antidotum arsenici and hot packings of the limbs were prescribed. During the following days diarrhea and faintness still persisted. After five days the patient's condition was normal again. The paste used was supposed to have contained 2 per cent of arsenious acid. The patient's disposition may explain the serious character of this case.

CAUTION IN THE USE OF CADMIUM SOLDER.

(*Zeitshrift Fur Zahntechnik.*)

Richard Bodanzky, a German chemist, has analyzed several specimens of gastric juice in order to determine the solubility of cadmium solder used in gold plates. He not only succeeded in detecting qualitatively the presence of cadmium in the gastric juice, but in one case quantitatively determined the amount present. Similar analyses were made with zinc solder, but in no case could zinc be found in the gastric juice. On account of the great toxicity of cadmium, great care is to be exercised in the use of cadmium solder.—*Cosmos*.

CLINICAL NOTE ON A SPECIAL FORM OF PERICEMENTITIS.

BY DR. CH. L. QUINCEROT.

(*Le Monde Dentaire*, Paris, 1908.)

It will often happen that a tooth which has been properly filled will cause violent suffering to the patient. Ninety per cent of cases of pericementitis are caused by too close contact. The case to which the writer refers to in his article he attributes to three factors of physio-mechanical, traumatic nature.

In these cases the sudden pain in filled teeth is due either to a masticatory shock, accidental traumatic pericementitis, or to the elongation of the treated tooth in consequence of modifications in the tissues, direct traumatic physiological pericementitis of constitutional origin, or to the pressure of the occluding tooth, which on account of its superior vitality does not undergo the same stress of friction as in the normal state; the treated tooth offering less resistance, indirect traumatic physiological pericementitis. Moreover certain teeth have a tendency to physiological evolution which leads to modifications of their crowns. The author endorses the statement of Dr. Leger Dorez (*Le Monde Dentaire*, Feb., 1908), in which it is said that the teeth change in form and volume from the time of their eruption until the death of the individual.

In incisors or canines, and especially in teeth which perform few or no masticatory functions, the cutting edges undergo a progressive deformation, which to a certain degree resembles rachitis in infants. The crown of these teeth is elongated, the root atrophied, and shade changed. These observations have been made in patients as young as 30 to 35 years, and the elongation amounted to from 1 to 2 mm., especially in aged patients.

If a case of this nature has been properly diagnosed, the remedy is simple and quick. The contact surfaces of the occluding teeth are ground off, and two or three applications of a solution of iodine in glycerine in the proportion of 1 to 4 parts are made to the gingivae by means of a cotton tampon, which is left in place from five to ten minutes, and this renewed five or six times a day. In very severe cases, one or two applications of the thermo-cautery to the gingivae of the aching tooth may be advisable. Correct diagnosis is essential.

SYPHILITIC CHANCRE OF THE TONGUE FOLLOWING DENTAL EXTRACTION IN A CHILD.

BY DR. DECREQUY (DE BOULOGNE-SUR-MER.)

(Les Archives de Stomatologie, October, 1908.)

The doctor reports the case of a child, aged 8, who developed in the right side of the tongue an ulcer exactly three weeks after the extraction, by a dentist, of the two temporary lower molars.

The classical symptoms—induration and sub-maxillary ganglionic engorgement—made him think of a primary syphilitic chancre. This diagnosis was confirmed by the duration of the ulceration, its rapid cicatrization without treatment, and the appearance of roseola.

The date the chancre made its appearance speaks strongly in favor of an inoculation by the tooth forceps. Fournier has reported such cases.

Notwithstanding that Butlin (our contemporary has throughout the article printed this eminent surgeon's name as "Bultin," which is obviously wrong) declares that syphilitic chancres of the tongue are rare in England, Roque and Gaillard, of Rouen, write this: "Chancre of the tongue is of frequent occurrence, and with it is found specific induration. The statement of Butlin is, at first sight, an astonishing one to proceed from one who has seen so many lesions of the tongue; but, after all, Butlin practices in England, and buccal chancres in man are generally genito-buccal in origin."

According to Fournier, a buccal syphilitic chancre is not very rare. Out of 824 cases of primary lesions, the seat was six times on the tongue and twelve times on the lips.

If infection by a dentist's instruments entered as a frequent cause into the etiology of buccal chancres, they would be more frequent in England. There as with us, the consulting-room of the dentist is also his office—a kind of a reception-room and an operating theater also—anything in the way of luxury satisfies his *clientèle*, and takes the place of asepsis. Rare are those who have a drying stove or boiler in their operating-room, and if one followed the instruments to the laboratory, one would see on which table they were placed after being boiled. One may conclude that if buccal chancres of genital origin are fairly frequent, chancres inoculated by the dentists' instruments are certainly very rare. It is clear without doubt that for their production conditions are necessary which are rarely found together.

NITRATE OF SILVER IN THE TREATMENT OF DIFFICULT DENTAL ERUPTION.

BY DR. JUAN DE OTAOLA.

(La Odontologia, Madrid, Spain, June, 1908.)

Starting from the premise that dentition exerts an influence on the diseases of infancy, the author accentuates the importance of a correct treatment of difficulties in dental eruption in order to benefit the general health of the child. Discarding iodine on account of its superficial action, a remedy was sought which would have a very deeply penetrating power to alleviate the cellular inflammation, loosen the tension of the tissues, act as an astringent and antiseptic, and assist the child in easily overcoming the obstacles in first dentition.

All these qualities were found to be combined in silver nitrate, applied to the inflamed and congested gingivae three or four times a day in very severe cases. If an improvement is noticed on the second day, the number of applications is reduced. The use of silver nitrate pencil has also proved very satisfactory. The silver nitrate solution applied should be fresh; a tampon of absorbent cotton of the size of the inflamed spot is first dipped in water, then saturated in the silver solution, and with a pair of tweezers gently rubbed on the morbid spot, which is very sensitive, even to the slightest touch.

The pains caused by eruption are most severe in the mandible, on account of the thickness of the bony structure and the congested condition, yet in ninety-nine cases out of a hundred the silver nitrate treatment will cause a complete disappearance of this morbid phenomena, unless a surgical operation is preferred.

If a partly erupted molar causes pain, a plegget of cotton, saturated in the solution, is introduced between the gingiva and the tooth, and inserted around the crown as deeply as possible, yet without exerting too much pressure. Generally, two applications on the first day and one on the following day will bring great relief, and avoid tendency to ulceration.

Treatment may be continued for several days, according to the severity of the case. In case of relapse, which is very likely to occur, repetition of the silver treatment is indicated, affording great alleviation of the pains, and precluding subsequent troubles for the young patient.



ORIGINAL CONTRIBUTIONS

TOOTHSOME TOPICS.

BY R. B. TULLER.

Well, I guess yep!

We've got a ottermobeel.

But I don't know but I'd ruther hev a sled or a pare of scates. It ain't all I thot it wuz goin' to be. You see, pa jest 'sprised us fer Cristmus.

'Tain't got no limmezeen to it, and it don't take in a hull crowd; but it goes without a hoss—when it goes.

It is the same one pa had a hoss to it, but pa's got her workin' now without no hoss—that is, he's had it workin' sum—jest a gassoleen moter in the back of the buggy what runs some wheels down through the bottum, an' them wheels hich in to the runnin' wheels.

The man who helpt pa make it in his blacksmith shop said it otter be called the "Cracker Jack" an' be patented; but I gess pa thinks he won't spend enny more money; an' he never let on to us until she wuz dun an' painted, an' then he rode up to our house an' tooted his horn as proud as a dog up in a waggin.

"Come on, ma," he sez, "you an' the kid, come on out fer a spin." Didn't take us long to git ready, but when ma went to git in she ast. "Why, Joel, this is cold wether. Where's yer lap robes?"

Pa hadn't thot ov that, but suggested that ma bring a bed comfort. Ma didn't fancy that wood look very stylish, but she got one an' a shawl to hide it, and we got in.

Then pa tuched sumpen an' I thot it mus be 4th of July or sumpen, 'stead of Cristmus, or a squad of police wuz after us with guns, for ther wuz the blamedest lot of bangin' behind us you ever heerd, an' ma neerly jumpt out of the masheen—me, too.

But pa sed: "Set down! Set down! What's th' matter with you? Ennyone wood think you never seen or herd a ottermobeel before!" Ma wuz white in the face—me, too—an' sed she wuz 'fraid the thing was goin' to bust up.

"Oh, pshah!" sez pa, "that's the way they all do. That's why

they are different frum waggins. Don't go an' expose yer ignerence." Ma sed: "If it is goin' to keep up that shootin' thru the streets I don't wanter go."

Pa sed: "Oh, that's all rite. She jest dose that caws she's impatient to start; she'll settle down nice as an old drivin' hoss." Then he tucht a bizness an' we were off, skimmin' along like a burd, an' ma got eezy an' I wuz proud of pa.

We wer p'inted fer the boulevard and park, but the street wuz icy and slippery, an' when we went round the first corner the blame thing skiddled, struck sumpen and tipt so quick pa hatto jump to save his self, and then it tipt back an' gotter feet ag'in; an' then heer wuz ma an' me goin' without no chawfer, an' she wuz makin' fer a tree.

Ma made a grab an' got holt of a levver an' give it a twist an' then we turned an' wuz makin' fer the other side of the street, an' vicry versy several times, like it was drunk. Meantime pa had made a run an' got holt ov the back end of the masheen, but owin' to the moter bein' ther, coudent clime in; but he kep yellin' to ma to pull this lever an' turn that, an' shutter off, &soforth, which ma tried to. Once she stopt short, but as quick as flash wuz a runnin' backwards an pa jest hatto hang on an' lift his feet to keep from goin' down under.

Then ma twist the other way an' here she wuz goin' for'ards agin'; but as she changed pa made a spurt an' got to the side where he cood reech over an' shutter off; but fore she slackt pa got cawt an' wuz down an' run over.

All this time ma an' me wuz screechin' fer sumbody to stopper. One man run out in frunt an' threw his arms up and down til he neerly got knoet down, but the macheen wooden't scare.

Well, after the thing run over pa she stopt and pa came a runnin' up, bruizd some, but not much hurt, 'cept his derb, which lookt as if it had got on a tare—it wuz tore—smashed.

Pa sed it wuz lucky the masheen wuzzen't one of them heavy ones, or he'd been finished. He went to git in, but ma sed she'd git out, an' me too. She woodent ride another foot in the thing fer 'leven hundred (\$\$) dollars cash.

By this time a crowd got around an' ast all kinds of fool questions an' makin' all sorts of fool comments, which made ma awful

red in the face, like when one sed, "Oh, git on to the daisy lap robe." That hit ma hard; an' she wuz mad all thru.

Then up comes a p'lliceman, an' he has to ast all our names an' a hull lot of imperdent questions, an' the ones that hit pa wurst wuz: "Phwat the devil kine ov a masheen d'ye call that? Phwat's the name av ut? Well, it otter be called 'High Bred,' ennyway, er th' New Mewl! I'm not surprised it threw ye an' run away. What's yer number? What! No number? Youse fer th' box."

Pa tried to 'plain that he had jest gotter out of the shop an' hadn't had time yit to get a number; but it woodent work. Then pa sed no need to call the waggin. "Git in," he said to the cop, "an' I will drive you to the station." "Oho! Not on yer loife," sez the cop, "an' I think you'll look better in th' waggen. They'll trail that." Ma an' me neerly threw a fit, but pa husht us an' told us to go over an' take a car home an' he'd soon see us, when he told the cap'n how it wuz.

Well, he got out by leavin' his masheen fer bale, an' next day he hatto go to court. They ony fined him 25 (\$\$) an' costs—providing he go an' take out a masheen license, an' then when they found he had no chawfer's license they ony hit him ten fer that—pervided he go an' git one, rite away.

Pa sez the machine cost him (4) hundrid (\$\$) dollers all told, besides the fines and licenses an' he gessess he's had anuff rite now. Ma sez she knows she's had anuff of the new Highbrid er mewl to last her. Then she sed with sum jinjer in it, "The man who invented that masheen an' tried to chawfer it, better stick to sawin' wood in peopple's mouths an' lett ottermobeels alone. He's got sand, sinders an' clinkers in his geer-box." Pa lookt like a man who was goin' to say sumpen, but changes his mind.

Later I seen pa printin' with a brush an' ink on a big card, "Fer Sail Cheep."

Yep, I gess I'd ruther hav some scates fer winter; but pa sez we've all had all the Crismus we're goin' to git this yeer. He sez when he gits 3 thousand \$\$ fer makin' a bridge he will buigh a limmerseen White Wings an' a chawfer with it." Ma sed, "Joel, when you git three thousand dollers fer a bridge we'll hav a White Wings air ship, an' tower Urope. Now you better go polish that 8 \$ plate 'fore the woman gits here."

Gee! But ma can let pa drop a long ways sometimes.



ABSTRACTS AND SELECTIONS.

INTERSTITIAL GINGIVITIS.

BY EDWARD CORNELIUS BRIGGS, M. D.

While the term "Rigg's Disease" conveys a pretty definite meaning to the profession and to a majority of the laity, many of the profession have felt that it was not a term of sufficient scientific import, and rather tended to emphasize the poverty of nomenclature in the dental department of medicine.

This led to the search for a more scientific name, and "pyorrhea alveolaris" became almost universal. This term, being descriptive of but one of many symptoms, failed to satisfy most of the students of this disease, and it remained for Talbot to point out that in all cases there was an underlying inflammation of the connective tissue of the gingiva and to suggest the name of "interstitial gingivitis."

CAUSE.

The cause of interstitial gingivitis is still a question of dispute, although many theories have been put forward, some, if not all, of utmost plausibility. The truth of the matter probably is that the causes are many, or rather, that many are the conditions in the economy which give rise to the disturbance in the nervous and circulatory system producing the breaking down of the tissues about the roots of the teeth.

That it is a local expression of systemic disorders seems to me the best solution, and this is the opinion reached by many of our best observers. The opponents of this theory argue that as the disease does not exist where there are no teeth it is, therefore, a purely local disease. This seems to me a specious argument, which if carried out to the fullest extent would admit the existence of few if any diseases of general or systemic origin when the result of that

*Read in the Section on Stomatology of the American Medical Association at the Fifty-ninth Annual Session, held at Chicago, Ill., June, 1908. Printed in "The Journal of American Medical Association," August 1, 1908.

disease expresses itself in definite localities. Take, for instance, gangrene of a toe: Would the absence of that toe and, therefore, of disease in that member preclude the possibility of the organic malady which tends to gangrene.

By many observers a connection has apparently been traced between interstitial gingivitis and rheumatism; this is in turn refuted by those who find cases in which no rheumatism can be traced. It is my belief that both are but expressions of metabolic disorganization.

Various other constitutional diseases, such as renal, heart and liver disturbances, have been charged with the paternity of interstitial gingivitis. Each disease has in individual cases been apparently proved guilty, but the very failure at other times to find the result and the alleged cause associated seems to prove that back of them all is a common cause.

In the attempt to find such cause it may be well to see if it is possible to trace a condition precedent to these diseases and common to them all.

Goldthwaite, in his investigations of rheumatism, finds more than a coincidence in the presence of pus as an antecedent in many cases of rheumatism. Elimination of pus from the frontal sinus, antrum, tonsils and alveolar regions has given great relief in his cases.

Many grave renal diseases, while causing untold misery from the fact that the disorganized kidneys can not eliminate toxic and irritating products of metamorphosis, are, according to one authority, caused by irritation from products of faulty metabolism, due to imperfect or improper digestion in the alimentary canal.

Talbot, writing on autointoxication, says that interstitial gingivitis is found in full sway in Bright's disease, diabetes, rheumatism, gout, asthma, nervous disorders, etc., before these diseases have become of sufficient importance to be observed by the physician.

Fletcher, the advocate of thorough mastication, who holds the distinction of having created a new word in our vocabulary, namely, "to Fletcherize," maintains that if his precepts are followed and perfect digestion thereby produced, muscular pain or soreness can not occur. Muscles may become fatigued and refuse to act, but the sensations of cramp or lameness which most people feel after prolonged or unusual exertion exist only in those cases where there has been either improper digestion or faulty elimination or both.

The conclusion, therefore, seems to follow that the ultimate cause of interstitial gingivitis is the common cause of many chronic organic diseases, that is, toxins in the intestinal canal; whether they be poisons absorbed from some external source or thrown off as a result of physiologic chemical action on food good in nutritive quality but wrong in quantity or improperly prepared for the alimentary canal.

Cause and effect: What a problem it is to prove which is which! If interstitial gingivitis occurs about a malposed tooth, is it simply because the tooth is there and because its position harbors the disease? Or has the malposition led to improper mastication, faulty metabolism and the breaking down of interstitial tissues at a weak spot?

Does the deposit of calcareous substance on the teeth cause interstitial gingivitis? Or has a weak and flabby mastication produced autointoxication, permitted the deposits to form, and thus presented a nidus for the interstitial inflammation?

It is my belief that the first cause lies in the intestinal tract and that given perfect conditions there will be no interstitial gingivitis. Mark the words, "perfect conditions"—the various and often comparatively slight causes which contribute to imperfect conditions will be touched on in the section of the paper devoted to treatment.

Intestinal putrefaction produces indican in the urine and as indican will always be found in excess in cases of pus formation, it seems logical to charge the indican in the tissues with being largely responsible for the condition which leads to the breaking down into pus.

As causes of intestinal putrefaction Fossume cites the following:

1. Improper mastication, resulting in gastritis with lessened hydrochloric acid.
2. Gastritis, the lessened hydrochloric acid stimulating pancreatic secretions. In such cases delayed digestion carries the peptones too far down the tract to be absorbed and the *coli communis* changes it to indol, skatol, etc.
3. Excess of sugar, due to catarrh following fermentation and accompanied by much mucus so that digestion is delayed by (a) impoverished juices and (b) mechanical obstruction caused by presence of too much mucus.
4. Excess of proteids, with normal digestion.

5. Too much fat in food, mechanically interfering with absorption, though the digestion and the quantity of proteids are normal.
6. Slow digestion, with normal quantity of proteids.
7. Lack of bile, thus favoring putrefaction, as bile is strongly antiseptic.
8. Weak muscular action of the intestines.

Talbot lays great stress on autointoxication as a cause of this disease and has pretty conclusively shown that the uric acid habit is not a cause of interstitial gingivitis, but like interstitial gingivitis, is only an expression of disturbed nutrition.

As has been said, observers have always shown a tendency to connect interstitial gingivitis with other systemic diseases—diseases whose origin is generally conceded to be due to faulty metabolism. Hence we find one man attributing the disease to rheumatism, another to gout, another to diabetes, etc., ignoring the fact that all these diseases have a first cause, which is faulty metabolism, and that, given the first cause, interstitial gingivitis becomes established, even in very young children (as scurvy) before the other diseases are diagnosed.

The treatment may be divided into, first, preventive and, second, curative, and each subdivided into local and systemic.

PREVENTIVE TREATMENT.

Local—Inasmuch as it has been shown that the blood vessels of the gingiva become choked with the products of metabolism, it becomes an absolute necessity that the circulation should be assisted in every way possible.

Hence the advantage is seen of massage, of mildly stimulating mouth washes and, above all, of the stimulation resulting from the hand-polishing system for which Smith is the sponsor.

The patient should be instructed in the use of the tooth brush, it being a well-known fact among careful observers that many who brush their teeth faithfully many times a day never really clean them.

Inflammation of the mucous membrane, due to malocclusion or impaction, calls for the necessary correction, as such irritation easily becomes the starting point of interstitial gingivitis. This, perchance, leads to much regulating of the teeth, which was formerly neglected when there was no visible deformity, and to regulating at a much earlier age, since interstitial gingivitis, given the necessary condition for development, is no respecter of age.

And this again leads to the subject of Fletcherizing, or the thorough and proper use of the teeth. Without their proper physiologic and anatomic use, all organs and members of the body tend to waste away or become a prey to disease, and the teeth are no exception. It, therefore, becomes evident that even a perfect set of teeth perfectly cared for can not be maintained in perfect health without perfect use.

No stomatologist fulfills his mission who, thorough though he may be in his technical care of the oral cavity, fails to hammer into the mind of his patient the paramount necessity of the thorough use of the teeth in mastication.

Systemic.—I fancy that any one who has followed me thus far recognizes that I at least believe that the starting point of interstitial gingivitis lies in the alimentary canal and that faulty metabolism, whether due to imperfect digestion and assimilation of true foods or to the ingestion of substances not properly classed as foods, such as alcohol, makes for a condition of the interstitial tissue which lends itself easily to inflammation.

As Talbot has reminded us, the blood vessels in the alveolar process cannot readily expand to the pressure of the blood, and if that blood be charged with toxins, then with high pressure and sluggish circulation the breaking down into inflammation becomes easy. Thus physicians are brought face to face with the importance—yes the necessity—of teaching temperance to their patients. Overeating and overdrinking are bound to fill the system with ptomaines and ptomaines largely of the toxic variety, and perhaps the worst thing about overdrinking is that it leads to overeating.

It should not be imagined that the small eater is necessarily not an overeater. He often eats some special kind of food to excess, as witness the sailors on long voyages who eat salt pork (and often not heartily) and become affected with scurvy (interstitial gingivitis).

Infants improperly or scantily fed have scurvy; and sometimes with plenty of variety at hand a man, through some perversion of taste, persists in eating some particular kind of food which the system cannot properly eliminate. Tea, coffee, alcohol and tobacco all have their charm, and almost every adult is a devotee of one or more of these stimulants. They are not foods; in fact, each to a

greater or less degree, according to its use or abuse, becomes a factor in upsetting the physiologic balance. The patient, then, must be taught that if he dance he must pay the piper. At the age of thirty, when the anatomic structure is complete, there is not the demand for tissue building that there was in youth. All material not necessary for the repair of the material wear and tear of the machine consequently becomes a clog in the system and interferes with the circulation. I have found that two meals a day are amply sufficient for a fairly strenuous life the last twenty years. Again I call attention to Fletcher and the tests of his endurance as made at Yale. Youths should eat proper food properly, and adults should refrain from over-eating and eating in ruts. Though the diet may be simple, yet its simplicity should contain a variety. If there must be a cereal every morning, it should be varied from one day to another—not a difficult matter in these days of so-called "breakfast foods." And so with any article of food, constant and continued repetition should be avoided.

CURATIVE TREATMENT.

Systemic.—For the patient presenting himself with a well-established case of interstitial gingivitis it is necessary to pursue an active and somewhat drastic course, both systematically and locally. The systemic treatment will be considered first.

To clean out the intestine I prefer to use podophyllin in centigram doses, giving two at night, followed by a saline on arising; then, to purify the intestinal canal, an intestinal antiseptic tablet made up of the sulphocarbonates of zinc, lime and soda, one at noon, another at night. The podophyllin is repeated the second night and the rest of the treatment the next day, and so on until the physician is reasonably satisfied that the bowel has been thoroughly scoured and purified. This should be followed up with phosphate of soda, 60 centigrams, *t. i. d.* for an indefinite period, or until the local treatment is finished and the patient put on the general preventive treatment.

If there is much soreness of the gingiva or dark red spots, tender on pressure, indicative of a gouty tendency, salicylic acid or aspirin, 30 centigrams, *t. i. d.*, will often act magically. In obstinate cases it is very well to try iodid of potassium, 30 centigrams, *t. i. d.*, not only because the presence of iodin in the system acts most kindly

in all cases of inflammation of mucous membrane, but also because the physician can never be entirely sure that a specific taint is not complicating the case. The usefulness of iodine in mucous inflammation, and also the fact that interstitial gingivitis may often be the first indication of arteriosclerosis, make hydriodic acid a timely remedy in such cases.

Calcium sulphid, an old remedy for sterilizing the system and checking the formation of pus, has of late received renewed attention from practitioners who have found it possible to get a pure preparation. It seems to be a clinical fact that saturation of the system with calcium sulphid, about gm. 20 to gm. 30 in twenty-four hours, will check the formation of pus in both alveolar abscess and in interstitial gingivitis. From my own observation and practice I am convinced of its efficacy.

The opsonic index has been taken in this disease. Treatment in accordance has been given a trial and favorable results reported.

The patient should be commanded to chew his food thoroughly, eating only what he can so chew.

The diet should be regulated, correcting the patient's tendency to take certain foods to excess and adding to his diet wholesome foods which he has eschewed owing to dislike or a fancied belief that they disagree with him. If the patient is over thirty the amount of flesh food ingested should be limited and the use of underdone meats discouraged. Almost invariably, on inquiry, it will be found that patients with interstitial gingivitis drink but little water. The deleterious effect of this habit in cases of interstitial gingivitis is too obvious to need further elucidation to the professional mind, but it is a condition too often overlooked. Six to eight glasses of water a day is little enough, yet few are they who drink as much. Obvious also is the importance of fresh air, exercise and deep breathing; yet these simple means for the establishment of good circulation are too often slighted or, because so obvious to the professional mind, their value is left for the patient to discover for himself.

To him the observance of these hygienic rules means simply an increase of his appetite, the indulgence of which in nine cases out of ten is just what should be avoided. It is elimination which should be sought, not further ingestion.

Old age, Metchnikoff says, is caused by the putrefaction of food

in the colon. Measures to arrest or prevent this putrefaction tend to prolong life. He recommends lactic acid ferment and suggests buttermilk as a simple form of treatment.

Based on his suggestions, there are now on the market tablets of lactic acid ferment which, it is asserted, produce a clean, sweet colon and hence freedom from arteriosclerosis. I have been trying the effect of these with apparently good results. Patients will be found with well-marked interstitial gingivitis whose diet seems most correct. The patient may avow that he has a perfect stool with daily regularity, but on close questioning will admit that the stools are foul. It is in such cases that Fletcherism is demanded, for it should be remembered that Fletcher maintains that his method produces a stool absolutely free from odor. As a matter of fact these patients admit in nine cases out of ten that they bolt their food.

While realizing the importance of the practice of thorough mastication in these patients, it is well to remember the excellent temporary effects of intestinal antiseptics. Various writers have called attention to indications for treatment of the alimentary canal from observations of the condition of the tongue; for instance, a broad, thick, pallid tongue calls for alkaline treatment, both locally and systemically, and a pinched, dry, red tongue is evidence of need of acid treatment.

Local.—While the treatment up to this point has called for the keen attention and skill of the stomatologist, it is now that he has the final word and here that his skill and faith in his works bring about the real cure. For with interstitial gingivitis once established nothing will avail without the most thorough, persistent and intelligent local treatment.

Riggs who wrote on this disease and to whom all honor is due (although I do shrink at giving the unscientific name of Riggs' disease to interstitial gingivitis), laid the greatest stress on the necessity of thoroughly scaling the teeth. Younger, who has done more for the cause than any other living man, has hammered at this point most insistently. He says that the teeth must be scaled and that if to scale one tooth properly takes all of a long sitting the time must be so occupied and the one tooth done most thoroughly. He, as well as Riggs, has given the profession a set of scalers of great value to the operator. There are many others, notably Harlan, who have em-

phasized the importance of thorough scaling and devised instruments to facilitate the removal of deposits. I only wish to say that they have not put the matter forcefully enough. Those who have had experience in transplanting and replanting teeth know that a tooth should not only be clean and free from tartar, but that it must be smooth and polished. Many of the scalers of finest temper and cleverest design fail to leave the tooth in this condition and, therefore, they fail. The set of instruments invented by C. M. Carr do not scrape or draw-shave the teeth, but plane them. When the tooth has been thoroughly planed by these instruments it is as smooth as glass. The varying lengths of operating shafts, curves, angles, etc., in devising which Carr has shown his genius, make it possible to reach every part of all teeth and their roots. He naturally emphasizes the importance of the perfect smoothness and cleanliness of the roots. In individual cases he can probably make his position good. His error is in considering the matter closed at that point and in not going deeper into cause and prevention. To sum up the instrumentation or operative treatment in interstitial gingivitis I do not hesitate to state that if with the teeth *in situ* the operator can produce the same freedom from deposits and the same polish that he could with the tooth in his hand and a cuttlefish disk in his engine, then he may be sure of curing for the time being any case of interstitial gingivitis. It is for the progressive operator to find the ways and means for doing this.

For the comfort of the patient and to enable the operator to work with deep and sure effect, it is almost a necessity to inject an anesthetic. Following are two good prescriptions for local anesthesia:

B		gm. or c.c. .
Eucaïn hydrochloridi (B).....	1	30 gr. xx
Chloretone.....	1	or gr. xvss
Fluidextracti hamamelidis, ad...120		fl <i>ʒ</i> iv
M. et sig.: For hypodermic use.		

B		gm. or c.c.
Cocaine hydrochloridi.....		90 gr. xiv
Chloretone.....	1	or gr. xvss
Fluidextracti hamamelidis, ad...120		fl <i>ʒ</i> iv
M. et sig.: For hypodermic use.		

The eucain solution is for those who dread cocaine or where the

operator fears its effects, the cocaine being perhaps surer in its anesthetic effect.

It is for the operator always to remember that if for any reason he can not perfect the smoothness of the tooth *in situ*, it remains for him to extract, polish and replant. While the concensus of experience shows that such teeth are apt to become subjects to absorption and come out after about seven years, yet I have cases of perfect teeth after a lapse of twelve years since replantation. It is impossible to place too much emphasis on the importance of the fixation of the teeth after such an operation, and also of teeth (not replanted) that have been loosened by the disease. Splints for this purpose are designed for temporary or permanent use, according to the necessity of the case.

It is now over ten years since I first made the assertion that, in proportion as teeth afflicted with interstitial gingivitis are in serious condition, in just that proportion is the removal of the pulp a necessary preliminary treatment.

Time and experience have only emphasized the conviction, and it is advised that the pulp be surgically removed where the disease has involved the root for at least half its length. In the majority of such cases the pulp will be found in an irritable condition, conducive to pulp, stones or exostosis, and in the case of multiple roots one or more are often found with the pulp dead. The removal of the pulp by pressure anesthesia, as previously described by me,* is easy and simple.

Remedies and medicines in treatment must now be considered. The cleansed pocket needs something to stimulate the soft tissues to new granulation and to contract and heal around the root. Lactic acid in 50 per cent solution is excellent and deserves trial. Aromatic sulphuric acid should always be in mind, especially if the disease has gone far and involved the alveolar process. They both promote the throwing off of any diseased bone tissues. I have found a mixture of carbolic acid and caustic potash, in equal parts, of greatest benefit in destroying soft tissue that is not granulating well or where there are exuberant granulations.

Iodin or compounds of iodin, as iodid of zinc or iodid of silver, have a most beneficial effect, the compounds especially adding to the well-known beneficial action of iodin the astringent and antiseptic

effect of the metals. At this stage of the treatment also trichloracetic and monochloracetic acids are useful. If the disease has not gone deep enough to warrant the removal of the pulp and yet exposes dentine that is very sensitive, nitrate of silver for the posterior and chlorid of zinc for the anterior teeth have their well-known uses. Adrenalin and chlorid of aluminum are excellent astringents to tone and constrict the soft tissues.

For the patient to use at home, the free application of bicarbonate of soda is prescribed for its well-known effect both on inflamed mucous surfaces and its obtunding effect on sensitive dentine.

Limewater, fallen somewhat into disuse, is a splendid alkaline astringent and detergent remedy. Salt, free and in solution, has often proved efficacious in reducing inflammation.

Mouth lotions made up of several carminatives in alcoholic solution do much to stimulate and tone sluggish mucous surfaces. The incorporation of perborate of soda in a tooth powder does much to keep the parts clean and aseptic.

Interstitial gingivitis is a preventable and curable disease, and the stomatologist who does not prove this fact to his patient fails in his duty.—*Register.*

*Internat. Dent. Jour., April, 1891.

ANESTHESIA BY INTRA-ALVEOLAR INJECTION.

BY F. L. FOSSUME, D. D. S.

It gives me great pleasure to appear before you this evening and offer a few words upon the comparatively new subject of anesthesia by intra-alveolar injection.

The greatest obstacle to the practice of dental surgery is the difficulty in anesthetizing the sensitive tissues of the teeth. Especially is this true with many who really need dental treatment most, as neurasthenic pregnant women and sensitive or nervous children. As a result high standards have had to be abandoned, and inferior and temporary operations performed, often resulting in the loss of permanent teeth by extraction. This last should be an unheard-of operation in modern dental surgery.

Many methods have been evolved for relieving the pain of dental

surgery, but we must all admit that there is still much to be desired, and that any refinement in technique which contributes to that end is a boon to the patient and to the operator. Most of those present saw the demonstration of intra-alveolar injection at my clinic this afternoon. In the hands of others, as well as myself, this method of anesthetizing has given very excellent results, always greatly diminishing the sensibility and usually producing absolute anesthesia for all dental operations.

Dr. Kjennerud, of Norway, first aroused my interest in this method about eighteen months ago. He claimed to have a new formula for a local anesthetic. Being skeptical upon that subject, I inquired as to his technique and was told that he used a very strong needle and forced it deeply into the alveolar process. Some experiments by Dr. H. S. Vaughan and myself showed us that when the needle penetrated the process deeply enough an unusual amount of dental anesthesia was secured. There was, however, so much bending and breaking of needles in attempting to force them through the dense outer plates of the alveolar process as to make the operation impractical. We found that any good sterile local anesthetic produced more or less complete anesthesia when forced into the cancellous tissue, so that it reached the nerve supply at the apex of the root of the tooth.

Later Dr. Ottesen, also from Norway, told me to use a Beutel Rock drill for penetrating the alveolar process. The technique is as follows:

Every precaution must be taken to obtain absolute asepsis. The gums are washed with boric acid or bichloride solution, followed by alcohol. Touch the gum with phenol, and then inject one or two drops of the anesthetic intradermically. Trephine the alveolar plate with a No. 3 Beutel Rock drill. Be certain that the anesthetic is sterile. Use a No. 17 canula on the syringe and inject two to eight drops. The amount needed varies with the thickness and cancellation of the alveolar process. The perforation is always distal to the tooth, and usually a buccal injection is sufficient. Great care must be exercised in determining the length and direction of the molar roots. The injection should be made as close to the root apex as possible, otherwise partial anesthesia only may be obtained.

I am sure that all of us have experienced severe mental and

nerve strain when performing radical operations upon hypersensitive tissues, such as the preparation of cavities with margins extended to the region of immunity, and proper step formation for the seating and anchorage of fillings and inlays. The extirpation of hyperemic pulps is very difficult with the usual anesthetic measures, and in many cases pulp stumps are permitted to remain. Sensitive dentine often prevents the correct preparation of abutments for bridge work. In many cases of pyorrhœa alveolaris the hyperesthesia of the tissues makes the curetting of abscess pockets and the thorough scaling and planing of the roots almost impossible.

I am daily convinced of the inestimable value of the intra-alveolar method of producing anesthesia. The above mentioned operations have been usually entirely free from pain. Patients have been quiet and unconscious of the nature of the work being done. Consequently there has been a great saving of time and energy. Therefore I have no hesitancy in urging you to give this method earnest consideration.—*Brief.* (Great care to use every antiseptic precaution, and only sufficient force to cause slow infiltration, should be made in any such method.—Editor *Dental Register*.)

RECENT STUDIES ON NOVOCAIN.

BY RICHARD H. RIETHMULLER, PH. D., UNIVERSITY OF PENNSYLVANIA.

In August, 1906, the *Dental Cosmos* (on page 882) published a note on "Novocain" which was discovered by Uhlfelder and Einhorn and put on the market by chemical works of Meister, Lucius & Brüning, at Hoechst-on-Main, Germany. Drs. Braun, of Leipzig, Brandt, Sachse, Port, Luniatschek, Dietze, Dependorf and Bieberfeld of Germany, and Messrs. Pinet and Jeay of France, immediately began a series of very successful experiments with this new anesthetic. Their good results have been corroborated by a large number of dentists, who prefer it to cocaine.

In *L'Odontologie*, March 30, 1908, M. A. Thioly-Regard, of Geneva, also published a study on novacain.

Novocain—or chlorhydrate of paraminobenzoyl-diethylaminoethanol—is an alkaloid seven times less toxic than cocaine and three times less toxic than stovain, which exerts no detrimental influence

on circulation or respiration. It is soluble in one part of water to one part of novocain, and the solution can be sterilized by boiling, ebullition having no effect upon its anesthetic properties nor altering its chemical composition. Dr. Braun of Leipzig has used novocain for various surgical operations, injecting 0.25 centigram of a 2 per cent solution of novocain without observing any symptoms of toxication. Drs. Danielson and Schmidt have obtained anesthesia by infiltration of a 1 to 2 per cent solution, and have had satisfactory results even in the topical application of a 5 to 10 per cent solution on the mucous and lingual membranes. In extreme cases the dose may vary between 0.01 and 0.10 centigram of novocain. B. Sachse uses for dental extractions a solution of 2 per cent, of which he injects from 1 to 5 cubic centimeters (17 minims to 85 minims), to which a sufficient quantity of adrenalin chlorid 1:1000 is admixed. A 1 per cent solution produces sufficient anesthesia for sensitive dentin, for separating and filing the teeth, and for resection of the apex of the root.

Dr. Julius Misch, of Berlin, reports 300 cases of novocain injection combined with adrenalin chlorid for sensitive dentin and extraction of roots. The patients never felt any pain during the injection nor was there any noticeable injury to the gingival tissue. Even in cases of inflamed gums, the action of the anesthetic was sufficiently effective. Bieberfeld affirms that novocain, far from weakening the action of the adrenalin, increases its action, his statements being confirmed by the experiments of Heinecke and Lowen. Novocain anesthesia is prolonged by the admixture of adrenalin chlorid; novocain has no effect whatsoever on the vaso-constrictor properties of adrenalin chlorid. With a weak solution of novocain, the duration of anesthesia is a much longer one than with a higher dose of cocaine solution. Ischemia of the gums is not as pronounced as it is with cocaine. Sachse observed that the sockets after extracting bleed more profusely. Misch has corroborated that the alveolar anemia is not so noticeable with novocain-adrenalin as it is with cocaine-adrenalin. These points are very important, because anesthesia combined with prolonged extensive anemia is dangerous to the life of the tissues and the organs depending upon their circulation. Cocaine-adrenalin injection very much endangers the life of the pericemental membrane and the pulp, while with novo-

cain-adrenalin the danger of mortification of these tissues is considerably lessened. One to 3 drops of a 1000 solution of adrenalin chlorid, added to each cubic centimeter (17 minims) of novocain is too strong. The best results will be obtained if one drop of a 1:4000 solution of adrenalin chlorid is added to each cubic centimeter of novocain. The injection of this solution will produce an anesthesia lasting from one-half to three-quarters of an hour. For numerous injections Dr. Misch has used one of the following formulae:

(A) Novocain,	0.10 ctg.
Normal salt solution,	10.00 ctg.
Borated adrenalin (1:400),	10 drops.
(B) Novocain,	0.10 ctg.
Normal salt solution,	5.00 ctg.
Borated adrenalin,	5 drops.

With novocain the after-pain, which follows cocaine anesthesia, is much less. Only in very rare cases was any after-pain felt and that was of little violence.

When preparing a solution of novocain-adrenalin the desired quantity of pulverized novocain is dissolved in distilled water and sterilized by boiling, after which the desired quantity of adrenalin solution may be added. A small quantity of adrenalin solution should be kept in an amber-colored bottle with rubber stopper, ready for use. Novocain solutions may be kept indefinitely and be sterilized repeatedly by boiling, although stale solutions must be carefully filtered. The syringes and needles, which are sterilized in solutions containing sodium, should always be carefully cleaned with a normal salt solution, since sodium decomposes novocain. Various firms are putting novocain on the market in very practical form, as Meister, Lucius & Bruening of Hoechst, Markess-Sevogel of Basel, and Acker of Karlsruhe. The experiments of Ad. Witzel, Cieszinski, Liebl, Paul Reynier (in *Revue Therapeutique Medico-chirurgicale*, November 1, 1907), G. Fischer of Griefswald (Saxon Dental Society, Hanover, February 3, 1907), and Kirchner (*Deutsche Zahnärztliche Wochenschrift*, July 13, 1907) sufficiently indicate the superior qualities of novocain for any sort of dental work that requires anesthesia. At one of the last meetings of the "Societe Odontologique de Geneve," M. A. Bardet introduced to the

profession a new sterilizer for hypodermic syringes and needles, which has no injurious effect on the metal. This solution is as follows:

Lime-water, 1 liter.

Tricresol, 20 grams.

Lime-water is prepared by dissolving 2 grams of calcium hydrate in 1 liter of distilled water; allow to stand a day or two and shake occasionally, after which it may be filtered and the tricresol added.

The merits of novocain were also discussed in the meeting of the Netherlands Dentists' Association of June 29, 1907 (*Tijdschrift voor Tandheelkunde*, Utrecht, May 15, 1908). Dr. Boelger reported forty-three cases, in only six of which the patient felt pain, while in four cases the results were doubtful. The injections have no noticeable effect on blood circulation or respiration. According to Fischer (*Deutsche Monatsschrift fur Zahnheilkunde*, April 1, 1907), the anesthesia with novocain is absolutely reliable. Novocain is six to seven times less toxic than cocaine and three times less than stovain. In a watery solution of 1 to 1 it can be heated to 120 degrees C. without harm to its anesthetic properties; stale solutions can be sterilized again by boiling. Its anesthetic effect can be increased by the addition of suprarenin. Hamacher uses a 4 per cent solution, Fisher a 1.5 to 2 per cent solution with an admixture of 2 to 4 drops of a 1:5000 suprarenin solution. Dr. Boelger recommends the following solution:

Novocain,	0.750
Thymol,	0.033
Sod. chlor.,	0.450
Aqua destill.,	50.000

The thymol acts as a preservative.

To two cubic centimeters (34 minims) of this solution, three drops of a 1:1000 suprarenin solution are added before the injection.

The general interest taken in novocain by both the dental and medical profession is furthermore manifested by an article of Dr. Struthers, in the *Edinburgh Medical Journal* for February, 1908. During the months preceding this publication the author has made use of novocain clinically for inducing local anesthesia by subcutaneous injection, and as he has found that the claims made for it seem well founded, he thought it might be of interest if he indicated briefly the evidence which his experience has afforded. His

remarks are based on some eighty-six cases in which he has used novocain and carefully noted the results, contrasting them with those obtained from the use of cocaine and eucain in some hundreds of similar cases. These results have been uniformly good, and although the number of cases may seem small on which to base an opinion, he is inclined to believe that novocain is at least of equal and probably of greater value as a local anesthetic than cocaine or cocaine for subcutaneous use.

In the first place, the author states that the drug is very soluble, and that its solutions are stable and may be repeatedly sterilized by boiling without in the least losing their power of inducing anesthesia. He has tested this by making up a large quantity of a stock solution and using it over a period of several months, sterilizing it over and over again during that time. The solutions combine well with solutions of adrenalin, and do not in the least interfere with the vaso-constrictor action of the latter.

For infiltration anesthesia the author has found that a solution of novocain in 0.75 per cent saline solution to the strength of 1:400, plus one drop of the ordinary 1:1000 adrenalin solution to every 2 or 3 drams of solution used, the strength of solution originally recommended by Braun, answers admirably. It corresponds to what may be termed the standard for infiltration of 1:1000 cocaine, but has the advantage that it may be used in larger quantities; for, while the limit of safety is reached when about four ounces of the cocaine solution have been used, at least six ounces and probably more of the novocain solution may be employed for an adult without any risk.

In addition to this, it diffuses readily and acts as quickly as the cocaine solution, anesthesia being satisfactory in ten to fifteen minutes after the injection is complete, and for this reason novocain is to be preferred to eucain, for the latter may require as much as half an hour to take full effect. The duration of the anesthesia is always more than an hour, often as long as three or four hours. After it has passed off there is often, as with other drugs, a variable amount of burning and smarting pain in the wound, and the author has seen no reason to infer that this is either greater or less than with cocaine, eucain, etc. Sloughing of the skin, which occasionally follows the use of local anesthetics, particularly eucain and stovain,

the writer has never seen, nor has he heard it reported after the use of novocain.

Several of the author's operations were done in children as young as five and six years of age. In no case was there any sign of toxic symptoms arising from the use of the novocain-adrenalin solution. Novocain has proved as satisfactory for regional as for infiltration anesthesia, and in conclusion the author states that he believes the advent of novocain a real, though perhaps slight advance in the possibilities attending the use of local anesthesia by sub-cutaneous injection. It is stable, readily sterilized, unirritating, and efficient as a local anesthetic when combined with adrenalin, and can apparently be used in doses to meet all requirements without any fear of serious toxic symptoms arising.

In an article on "Local Anesthesia by Novocain," published in the *British Medical Journal* of May 18, 1907, Dr. J. W. Pare reports seventy cases, in all of which the application of novocain was most satisfactory. His procedure in administering this anesthetic may prove interesting:

(1) I give the patient half a pint of warm carbolic lotion with which to vigorously wash out the mouth, so as to reduce its septicity.

(2) The all-metal hypodermic syringe (with vulcanized "vela" rubber packing), needle, glass measure, glass mortar, glass mixer, are all placed in hot water to raise the temperature to that of the patient.

(3) If the patient be neurotic, a swab containing a 5 per cent solution of novocain is put on the gum for five minutes, so as to render the latter insensitive to the insertion of the needle.

(4) One or two novocain tablets, each containing one-third grain of novocain, are dissolved in 33 minims of hot water to make either a 1 or 2 per cent solution, respectively.

(5) Hot water is passed through the syringe and needle, the novocain solution is drawn up into the syringe, and the syringe inverted to allow the air bubbles to rise into the needle, from which they are easily displaced by pressing the piston.

(6) If an upper tooth, for example, is to be extracted, the needle is inserted into the gum one-eighth inch above the cervical margin, and a drop or two of novocain solution is forced in. I keep the needle in position a few seconds to allow the anesthetic to act

before forcing any more fluid into the tissue. After forcing in the solution, the needle should not be immediately removed, because if this is done then, owing to the pressure being greater in the gum than outside, some of the fluid will escape. If the position selected be a good one (between the roots is better than over them) the gum will gradually blanch and become of the consistence of cheese; the needle should then be removed and again inserted just inside the periphery of the blanching, and so on, till the whole of the gum on both sides of the tooth is anesthetized. I do not hurry the injection, but take about three to five minutes for the process. The tooth can then be extracted. I have so far never used more than three tablets (one grain of novocain) at one sitting.

In concluding Dr. Pare summarizes the advantages of novocain as follows:

- (1) It produces a perfect local anesthesia.
- (2) The duration of the anesthesia is longer than that of cocaine.
- (3) Even in strong solutions it does not irritate the tissues.
- (4) It is at least equal to cocaine in anesthetic power.
- (5) It is many times less toxic than cocaine, in comparison with which it can be used in larger doses with perfect safety.
- (6) It is very constant in its action.
- (7) It does not produce shock, cardiac or respiratory failure, after-pain, nor sloughing of the gums.
- (8) It can be given immediately after food.
- (9) It is not a secret preparation, but a substance of known and definite chemical composition.
- (10) It is cheaper than most proprietary anesthetic preparations.

A very interesting case, which goes to show that the experiments with novocain are by no means finished, is cited in the *Deutsche Zahnartzliche Wochenschrift*, June 27, 1908. Dr. Guido Fisher of Griefswald reports a case of narcotic slumber after local anesthesia with novocain, which had been administered to a strong and healthy woman of thirty-six for the purpose of extracting the gangrenous roots of a lower second molar. Anesthesia was obtained by an injection of three cubic centimeters (50 minimis) of a 2 per cent novocain-thymol solution, to which three drops of a synthetic suprarenin solution (1:1000) had been added immediately before inject-

ing. The injection, as is usual in patients with a good constitution, caused no pain to speak of. On account of the difficult diffusion in the mandible, it was estimated that the anesthetic would require fifteen minutes to take full effect; in the meantime two cavities in teeth in the left maxilla were excavated.

About one minute after the injection the patient felt an extensive numbness in the entire half of the left mandible, and after five minutes was unable to feel the rinsing glass at the left side of her lips. At the same time the pulse was accelerated for about one or two minutes. Then the patient fell into a sort of doze and seemed to have difficulty in keeping her mouth open for the preparation of the defective upper teeth. Pulse and respiration were soon normal again, and the patient gave the impression of a comfortably slumbering person. As if in an hypnotic dream, she followed every one of the operator's instructions, rinsed, opened and closed her mouth, without opening her eyes or being conscious of what she was doing. The upper cavities were filled with amalgam, excavation producing no pain whatever, although the bur came very near the pulp. Twenty minutes after the injection two badly decayed roots were removed: Immediately after the extraction the patient raised herself as if startled, opened her eyes and thoroughly rinsed her mouth as directed. She appeared to be completely changed, acted normally, and stated that pain, apparently caused by pressure, had startled her. The numbness in the left side of the jaw was still present, and the woman blushed when she heard that she had been asleep. She was proud of always having had an exceedingly strong constitution, and mentioned as a sort of excuse for her sleeping that her system had always quickly and intensively reacted to any medicine. She attributed her slumbering to this peculiarity, the normal dose evidently having affected her much more strongly than it would an average person. She did not know what had happened while she was asleep and was glad to hear that her two upper premolars had been filled. The patient left the surgery fully conscious and feeling very well.

This case of short "hypnotic" slumber was evidently due entirely to the effect of the novocain. Erotic affections such as have been frequently observed during general anesthesia and occasionally during local anesthesia with chlorid of ethyl and cocaine seemed to

be entirely wanting in this case. Nevertheless light narcotic sleep after application of novocain might occur in a sexually easily excitable person; again a note of warning must be sounded to always have a third person present, not only in general but also in local anesthesia, in order to avoid all possible danger of suspicion.

The extraordinary effect of novocain in this case must be considered as a mild intoxication, or irritation rather, of the central nervous system, brought about by the small dose of 0.06 novocain. It is remarkable that not one of the toxic phenomena of novocain heretofore observed and tested by F. Liebl (*cf. Munchner Medizinische Wochenschrift*, 1906, No. 5), was present in this case. Four minutes after injecting 0.75 gram of a warm 10 per cent solution into his right thigh, Liebl felt "a sudden peculiar warmth in his entire body, especially in the region of the liver, slight indisposition and nausea, and general restlessness. There was no noticeable change in pulse nor complexion. Two minutes later slight deafness in the left ear was perceived. Optic disturbances: Accommodation possible only with greatest effort, especially in the left eye; double images. Thirteen minutes after the injection, light piercing headache in the left occiput. Seven minutes later, paresthesia in the region of the left scaphoid bone." After an indisposition of half an hour normal comfort gradually returned.

The slight acceleration of the pulse shortly after the injection in the present case is probably to be attributed to the suprarenin rather than to the anesthetic, since it has never before been observed with solutions of novocain thymol. Liebl also remarks explicitly that pulse and complexion showed no change.

It is interesting and important that novocain, which has an extremely light toxic effect upon the tissues and can be borne even pure without any disturbances, may occasionally call forth an irritation of the central nervous organs even if applied in a dose far below the maximal. A system which, as in the case presented, apparently reacts to the most minute chemical irritations and whose protoplasm is exceedingly sensitive, may individually require a maximal dose far below that heretofore generally accepted, although the quantity of solution was larger. For, whether intoxication of the central nervous system with novocain is manifested, and in what intensity, depends, according to H. Braun, not only upon the dose

of novocain injected, but also upon the time in which it was injected. If the solution gets into the blood suddenly, that is, in concentrated form, then that dose can have immediate toxic effects; while, if injected slowly, that is, in dilute form, or if administered at intervals, the novocain solution would produce not even the slightest indications of intoxication of the central nervous system, because the concentration of novocain in the capillaries of the nervous system never exceeds the toxic degree of concentration.

Dr. Klein, also, reports having observed five cases of pronounced toxic effects after novocain (*Deutsche Zahnartzliche Wochenschrift*, page 138, 1908). Two of these cases were due to a complication of functional disturbances in the heart, lack of power of resistance of the entire system and abnormal menstruation; in the other two cases, however, novocain alone was to be considered responsible for phenomena of collapse. Dr. Klein's two cases as well as the case presented by Dr. Fisher must be regarded as exceptions to the rule. After three years' experience with novocain, Dr. Fisher is inclined to once more emphasize its advantages over cocaine, although in very rare cases it has manifested unpleasant secondary phenomena. Yet these secondary phenomena have been of such a mild and tolerable character that the good reputation of novocain in regard to its toxicity has not been impaired. For it is a local anesthetic which only when applied in a dose of 0.75 gram, a quantity which is out of the question in local anesthesia, and only under conditions especially favorable for resorptive effects (10 per cent solution at body warmth), showed phenomena of slight yet relatively harmless intoxication, which bears absolutely no comparison with the uncanny phenomena of cocaine poisoning. Even 0.4 gram of a 10 per cent solution produced no toxic effects. Toxic cases with novocain have been so rare and of such a singular nature that its use on the whole may be called most satisfactory. Among 5000 cases of novocain injection, Dr. Fisher cannot cite one single case of serious intoxication, while the grave accidents with cocaine are still fresh in our memory. Nevertheless the few interesting abnormal conditions after the use of novocain only prove the old rule that the patient's individuality plays an important role in every remedy.

Cocaine not only often causes general disturbances, but it not unfrequently—especially if a not quite pure solution has been ap-

plied—starts a process of local gangrene in the region of the tissues anesthetized. This has never been observed after novocain; also after-pain has been reported only exceedingly rarely after novocain injections. The formation of edema, especially after the extraction of badly decayed teeth, can no more be prevented by novocain than by any other anesthetic.

For his private use Dr. Fischer has now from time to time prepared a quantity of solution after a formula which only slightly varies from the one recommended by him two years ago; in its essence it coincides with that of Dr. Boelger:

Novocain,	1.000
Thymol,	0.033
Sod. chlor.,	0.450
Aqua destill.,	50.000

This solution is preserved in dark bottles, closed with rubber stoppers and holding 850 minims. The solution, which is prepared at boiling heat, if kept in well-closed bottles, remains for months as clear as it was on the first day, and, when needed, is poured into a small glass dish, in which one drop of fresh 1:1000 synthetic suprârenin solution is added immediately before the injection. The prepared mixture must be used up immediately.

Pure novocain powder, moreover, renders excellent service in the treatment of all forms of acute inflammation of the oral cavity, especially in the therapy of painful wounds, difficult dentition, etc. In regard to surprisingly quick and lasting removal of pain and to the production of sound granulation its invariable effects are unequalled.

In spite of these in the main excellent experiences with novocain, which have been endorsed by numerous authors, this anesthetic has not been adopted by dental practitioners as generally as its merits would warrant. Unfortunately a great many well-advertised secret preparations are still on the market. It is very much to be regretted that many dentists, instead of profiting by the scientific experiments so conscientiously conducted at different dental schools, still put faith in the expensive and greatly overrated secret preparations. Novocain has proved itself much less dangerous and surely no less powerful than cocaine or any secret anesthetic, and it cannot be emphasized strongly enough that local anesthesia in the majority of

cases is the only indicated method for the prevention of pain. Its application, to be sure, requires a special technical ability which seems to be lacking with some practitioners. Many dentists for the sake of convenience never fail to apply anesthesia even in most insignificant cases, and thereby forget what great risks their indifference entails for the life of their patients.

If one observes the successful efforts of general surgery in limiting general anesthesia by the introduction of lumbar anesthesia, and therewith compares the wide disagreement prevalent in the dental profession as to anesthesia, one can hardly dispel the feeling of solicitude for the further development and final perfection of this most important branch of dental science.—*August, 1908, Cosmos.*

HOW TO FILL TEETH WITH GOLD.

BY J. V. CONZETT, D. D. S., DUBUQUE, IOWA.

Cavities in the approximal surfaces of incisors almost invariably begin immediately above the contact point in the upper teeth and below the contact point in the lower teeth. We sometimes hear of dentists advising their patients to let such small points of decay go for a while, telling them that they are not large enough to fill. I have no patience with any such philosophy, for if caries is present the sooner it is stopped the better. For a cavity that seems to be but a pinhead spot, externally will when opened up prove to be a very large cavity, the microorganisms of decay going forward toward the pulp chamber, and backing up under the enamel until the interior of the tooth is almost entirely carious before the overhanging enamel walls break down. It is such cases that cause the patients to come to us with the assertion that the tooth went to pieces all of a sudden, and that it had only been decaying a week or so. If the carious spot is there and has penetrated the enamel, cut out the decay, prepare your cavity and fill the tooth.

In this class of cases, after separation has been obtained and the rubber dam adjusted, break into the cavity with a Wedelstaedt chisel or a small Black hoe. Then with a small round bur (No. 2 is what I usually use), undermine the enamel all round the cavity and with chisels and hoes break down the undermined enamel walls. Do

not try to cut the enamel. It is very difficult to cut, dulls your instruments and prolongs your operation; but as the enamel walls are undermined it is astonishing how easily they break down. In cutting the dentin always cut with a sweeping motion—away from the pulp and not toward it. In this way you very appreciably minimize the pain, and do not hold your bur on the dentin until it gets hot, for one of the greatest sources of pain in dental operations is the heat that is generated by a rapidly revolving bur, held firmly and too long a time, in contact with the tooth structure. With a sharp bur, rapidly revolved and swept along the cavity in lines away from the pulp, teeth can be excavated with comparative comfort that under other circumstances would be intolerable. Even if the decay is small, the cavity must be cut into immune territory, so in my practice there are no pinhead fillings in the approximal surfaces of the incisors, or indeed of any teeth. If the patients object to the cutting necessary to make a permanent filling, put the question squarely to them, explain the situation, and they will usually allow you to do that which you know is best. If not, then place the responsibility upon them and make them understand that you do not expect such operations to be of a permanent character. I have had very little trouble along that line, and am independent enough to tell such patients that if I cannot operate as I please I will not operate at all.

The cavity must be extended gingivally far enough to be covered by the gum tissue as it comes down into the interproximal space, far enough labially that the margins will be kept clean by the movement of the lips and excursions of food in mastication, far enough incisally so that the contact point will be above the margin of the filling and that the incisal margin will not be in contact with the approximating tooth and far enough lingually so that the margins will be entirely clear of the approximating tooth. This margin seems to be the vulnerable point in fillings in the approximal surfaces of upper incisors, judging by the many failures that I am constantly seeing in this class of fillings, and the reason is, that men do not cut their lingual margins sufficiently far. Most men seem to operate from the labial surface, open their cavities there and utterly neglect the lingual surface so that the lingual margins are in contact with the adjoining tooth, in consequence of which there is sooner or later a recurrence of decay at this point and the filling is a failure.

Or if they do attempt to cut out the lingual plate they fail to cut it far enough to gain access for their plugger point from the lingual surface, and they are unable to properly condense their gold at this point, and there is a failure through a faulty adaptation and condensation of gold at the lingual margin. All of this is obviated if the margin is cut wide enough to allow the operator to reach his cavity with his plugger point from the lingual surface. Fortunately we do not hear any objections to this doctrine now, as the men who decried this practice most strenuously a few years back are now cutting these margins a great deal more than we advise, that they may gain space to insert their inlays. If it is permissible to cut to gain access for an inlay, it is obviously proper to cut to gain sufficient space to properly adapt and condense your gold. The most vulnerable points in this class of cavities are the linguo- and labio-gingival angles, and this is so because in the preparation of these cavities it has been the habit to round off these angles, thereby throwing them deeply into susceptible territory. Square out your cavity at these angles. Make the gingival seat flat with the gingival margin, conforming somewhat to the curve of the gum festoon; this will throw your angles out and free from susceptible territory, as indicated in Fig. 3. The interior preparation must follow the rule of square seat and parallel walls as nearly as possible. In making the flat seat care must be taken that it is flat and that it does not slope away from the cavity walls, as is the tendency in all beginners in this class of work, for if it does the tendency of the filling will be to slide out of the cavity, and the probabilities are that it will do so sooner or later. Neither should the seat incline toward the pulpal wall, for in proportion to the pulpal inclination of the gingival seat will there be a weak margin, due to the cutting away of the supporting inner dentin from the margin. The axial walls should be as nearly parallel as the nature of the tooth will allow. They will, of course, converge toward the incisal angle to form a point angle at the incisal retention. In Fig. 1 we have a labial view of the cavity showing the amount of labial extension. In Fig. 2 we have a lingual view of the same cavity showing the lingual extension, and in Fig. 3 we have a view of the approximal surface showing the gingival and the incisal extensions and the curve of the gingival margin and extension of the labio- and linguo-gingival angles. This view also shows

the internal preparation with the flat gingival seat converging walls and their point angles, one of the linguo-gingivo-axial angle, another the labio-gingivo-axial angle, and the third the labio-linguo-inciso-axial angle. These angles are accentuated somewhat and it is permissible to deepen one or more of these angles as convenience points in starting the filling. Care should be exercised in this, however, in not making them too deep. Pits are not allowable for two reasons. First, they are a menace to the strength of the tooth and, second, are hard to fill perfectly, and if this is not accomplished there is left a vulnerable point in the finished filling.

The internal preparation of the cavity should be made with

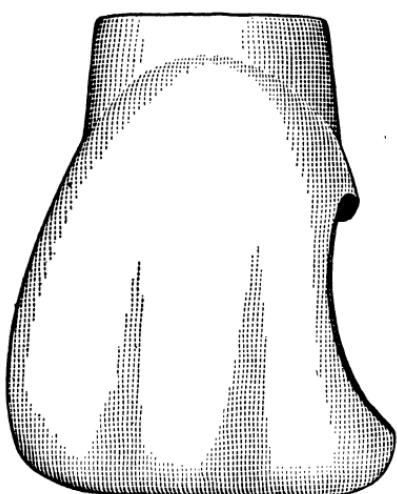


Fig. 1.

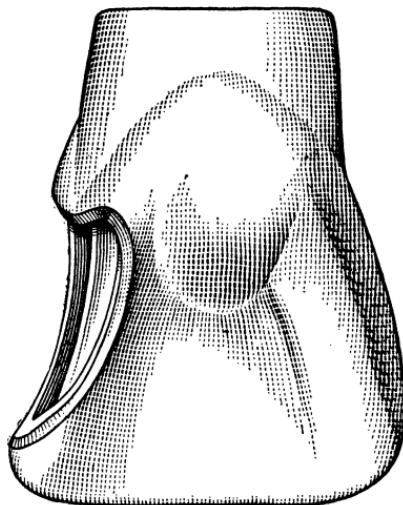


Fig. 2.

inverted cone burs and hoes. In this class of cavities I usually use a No. 35 or 37 inverted cone bur and, sweeping back and forth, obtain a flat gingival seat; with the same bur I then proceed along the lingual and labial walls and make converging walls toward the incisal angle. After approximating the desired form the bur is laid aside and the walls squared up with hoes of convenient size. In obtaining the point angles and in squaring up the walls a favorite instrument of mine is the No. 33½ inverted cone bur. Care must be exercised in using this instrument, for the object is not to make grooves and pits, and one can so easily do it with such a bur that I

sometimes hesitate to advise its use, and yet it accomplishes the result so beautifully and so expeditiously that I cannot refrain from recommending it, with the cautionary advice that its use is only to augment the work of the other instruments, and not intended for grooves and pits, for they are not allowable under any circumstances in this system of cavity preparation.

Fig. 3 alone shows the preparation of the cavo-surface angle. In the preparation of any cavity it is essential that we have an understanding of the anatomy and histology of the tooth. In the preparation of the cavity outline we must know the structure and arrangement of our enamel walls. It will be impossible for me

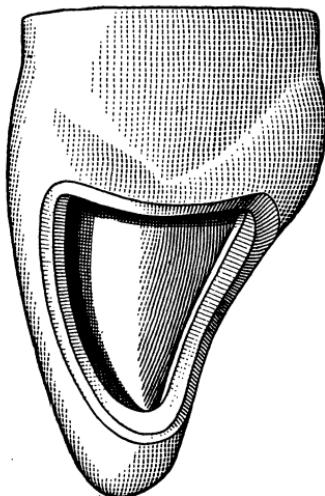


Fig. 3.

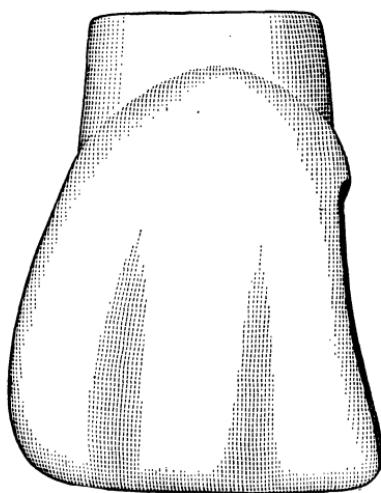


Fig. 4.

to take up the discussion of such a subject in these papers even if I were able to do it. Happily one that is able has most beautifully and exhaustively done this work for us, and I commend to all students Dr. F. B. Noyes' work in the American Text Book of Operative Dentistry. Suffice it to say that the cavity outline must be so arranged that there shall be no short enamel rods unprotected, for if they are they will fall out and leave a point of attack for the microorganisms of decay. No work on the enamel can be absolute, as there are so many deviations from the type; so if we have a general knowledge of the arrangement of the enamel walls we

must supplement that knowledge in each case by the action of the enamel under our chisels, and with a knowledge of the cleavage of the rods so obtained in each individual case, so lay out our cavo-surface angle that all rods may be protected. All the enamel margins should be well beveled, and this is best accomplished with a very sharp chisel or hoe. Under no circumstances use a sandpaper disk or any instrument that will polish the margins, for it is almost impossible to perfectly adapt gold to a polished surface.

We occasionally find teeth in which the contact is at the extreme incisal angle. In the preparation of cavities in such cases, if the usual line of procedure were adopted, we would have our contact between tooth substance, and the margin of our filling would be above the contact point, and, consequently, in the most vulnerable spot. To obviate this difficulty either one of two measures may be adopted. First, the cavity preparation already outlined may be used, but in making the fillings, supposing of course that there are cavities in the approximating surfaces of both teeth, a plus contact is made in such a way that the contact point is made with the fillings above the incisal margin, and then these angles can be rounded off with a sandpaper disk to more perfectly clear the margins of the fillings. If it is not advisable to do this for any reason, then the cavities can be made as already outlined, except that the enamel is beveled so that the filling can be built clear down to the incisal angle, thus permitting the contact to be made at that point. The contact, however, will be upon the surface of the fillings without encroaching on the margins. Such a cavity is illustrated in Fig. 4.—*Digest.*

WHAT CAUSES THE DENTIN TO BE SENSITIVE.

BY C. F. KABELL, D. D. S.

The dentinal tubuli by the very minuteness of their size must have very strong capillary attraction, therefore are necessarily filled with liquid, be it serum, nerve fluid, lymph or plain water.

In the healthy tooth these tubules will be entirely full, but through decay or operative measures the exposed openings of the tubuli are subjected to atmospheric pressure, evaporation and the affinity of acids and alkali for water.

Let us first consider atmospheric pressure. If a capillary tube that has the capillary force to lift water ten feet is broken to the length of six inches, the water in this six-inch tube will not run out of the opening, but will sink a trifle in the tube, because the free opening is subjected to atmospheric pressure.

This will happen in the dentinal tubes when cut by the drill; the volume of liquid in the cut tubuli will sink and exert a pressure on the protoplasm of the odontoblasts which penetrates thread-like into the other end of the tubuli.

This sudden shock is transmitted as pain by the nerve fibrils which are supplied to the odontoblasts.

As proof of this theory I mention:

1st. The very painful sensation when we drill at right angles to the tubuli, because we constantly irritate nerve fibrils through the sinking of the liquid in the tubules.

2d. When we drill parallel to the tubuli the procedure is less painful because we administer a succession of shocks to the same nerve endings, which lose their transmission power on account of the physiological fact that nerves easily grow tired and in that state will not respond any more to irritation.

The removal of decalcified dentin is painful because before its removal it closed the tubuli and the excavating exposes the tubuli to free atmospherical pressure.

Hot air causes pain by evaporating the liquid out of the tubuli. This loss its capillary attraction will seek to supply from intercellular liquid in the pulp chamber.

Changes of temperature by hot or cold water or fillings cause

expansion or contraction of the intertubular liquid with the resultant fluctuation in volume.

Spunk, I think, causes pain by absorbing some of the liquid out of the tubuli, although its action can probably be explained in the following way: When moisture is covering all the tubular openings it will be the chief source of supply for the dentinal tubuli, so that atmospheric pressure will not be felt very much; in the same way as a stream of blood-warm water directed against the field of operation will ease the pain of drilling.

On removing this moisture, the intercellular liquid is again called upon with resultant disturbances and pain.

Alcohol, acids and alkalis act in a similar manner by their affinity for water, thereby causing a replenishing from the liquid in the pulp chamber.

Here osmosis might play an important role after the first shock of the application, to explain their sometimes desensitizing action.

PROOFS OF THE THEORY.

In preparing a tooth for crowning I found the dentin so sensitive to grinding that I had to devitalize. I was lucky to open the pulp chamber quite freely and here the idea struck me to test this theory.

I reasoned that if atmospheric pressure were now directly supplied to the contents of the pulp chamber it would counterbalance any action of the same force directed to the tubuli, and sure enough, the dentin which before would not bear any grinding could now easily be cut without any pain to the patient.

Another proof is the action of nitrate of silver; by mechanically closing the tubuli it materially reduces the pain of cavity preparation.

In order now to understand why such minute changes in the amount and movement of the intertubular liquid will effectively cause shock and resultant pain, we must assume that the protoplasm of the odontoblasts snugly fills the opening of the pulp chamber ends of the tubuli, an assumption we have to take for granted when we consider pressure anesthesia.

When we apply a concentrated solution of cocaine to the dentin, hydrolytic action will set in and the amount of the cocaine in the intertubular liquid will soon be equal to the remaining amount of

the salt in the applied solution, and if the tubuli were not closed the intercellular liquid would soon have an equal quantity of cocaine throughout the pulp chamber.

As a simple topical application has no perceptible effect, this assumption must be correct, and only by applying pressure do we mechanically open the tubuli and gain the desired result.

This last sentence I leave open to discussion because I am not sure whether the sluggishness of a strong cocaine solution will have any part in desensitization or what factors outside of chemical action might contribute to the result, but in my humble opinion I claim that this theory explains pretty well the different phenomena of dentinal sensation and the effects of our different methods to overcome it.—*Items of Interest.*

PLATINUM BANDS.

I believe that more iridio-platinum and platinum should be used about the gum in bridge work. In fact, I think you must have all been put on that many times they are not very well fitted, and yet I noticed in many mouths where porcelain and platinum crowns have have noticed that these platinum bands did not collect the viscid secretions in the mouth as does the gold. I have been very much pleased with this discovery, and I have a mind to use more iridio-platinum and platinum bands than I have in the past on that account, because they do keep clean in the mouth, and from a prophylactic standpoint, they are much to be desired over gold.—*Dr. C. P. Wood, Register.*

CURETTING THE END OF A ROOT.

Wipe off the field of operation with alcohol; then make a crucial incision over the root of about a quarter of an inch in length for each incision; then with a spear-shaped drill in the engine go through the alveolus and through the root; then in the drill hole insert a fissure bur and oscillate it laterally until you feel confident the apex is cut off. Oftentimes it is best to follow up with a round bur and cut up and destroy the amputated parts, as it is not always expedient to remove that part with forceps, and, indeed, it is not always necessary to do so, as frequently nature will take care of it, either by sloughing it off en masse, or by destroying it molecule by molecule.—*Dr. C. P. Pruyn, Review.*



MEETINGS

CALUMET DENTAL SOCIETY.

The annual meeting of the Calumet Dental Society was held at Gary, Ind., December 7, 1908. The following officers were elected: President, Dr. B. S. Gardner, Gary, Ind.; vice-president, Dr. G. W. Winslow, Chicago, Ill.; secretary-treasurer, Dr. J. H. Long, Gary, Ind.
J. H. LONG, Secretary.

THE NEW YORK ALUMNI ASSOCIATION.

The New York Alumni Association of the Xi Psi Phi Fraternity met at the St. Denis Hotel on November 18th, and elected their officers for the ensuing year. It was decided to hold our banquet on January 30, 1909.

Our membership has passed the 200 mark, and it is earnestly desired that every alumnus be present.

To any who have not received full particulars, the same will be gladly furnished by our secretary.

J. N. GELSON,
673 Vanderbilt Avenue, Brooklyn, N. Y.

NATIONAL DENTAL ASSOCIATION.

At the 1908 meeting the National Dental Association adopted an amendment making all members in good standing in their state dental societies or their allied societies eligible to membership in this association, by presenting to the proper authorities at the regular meeting a certificate signed by the president and secretary of any such society.

Those desiring to take advantage of their privilege under said amendment should act promptly as the national association meets early next year, the last Tuesday of March, 1909, at Birmingham, Ala.

Blanks can be secured from the secretaries of the various state dental societies or the undersigned.

H. C. BROWN,

Corresponding Secretary.

185 East State street, Columbus, Ohio.



MISCELLANEOUS

TO KEEP A HYPODERMIC NEEDLE FROM RUSTING.

When we buy the needles they are provided with a small wire inserted in the needle. Replace this with a coarse hog's bristle or one from a large paint brush when the needle is not in use.—*P. J. Pegan, Lebanon, Ill., Review.*

CONVENIENT BROACHES.

Instead of using a small handle, have had a great deal of success in instructing assistant to soft-solder on old instruments of different angles. Such instruments are always at hand, disinfected and easily applied.—*W. M. Cooper, Frankfurt, Germany, in Review.*

DETECTING MOISTURE IN INVESTMENTS FOR INLAYS.

A sure way to determine if the moisture is all driven out of the investment for gold inlays, during the preliminary heating, is to place the investment, sprue end up, on the zinc top of the work bench, and if any moisture remains in the investment a round, moist spot will show on the zinc.—*C. B. Plattenburg, Chicago, in Review.*

ENLARGING ROOT CANALS WITH BROACHES.

I have almost given up enlarging root canals with broaches, having found difficulty in knowing how far to go. The great difficulty is presented by the fact that with the broach there would be a little bur or shoulder past which one would not be able to penetrate, and lose track of the depth of the root canal.—*Charles Monk, Wiesbaden, Germany, in Review.*

METHOD OF MANIPULATING THE TOOTH BRUSH.

After some years of experience, I advise patients, after charging the brush, to begin with the lingual surfaces of the anterior teeth and afterwards the buccal surfaces of the molars, and then the upper and lower anterior teeth. After the brush, advise silk charged with a paste made from the same tooth powder. The method is recommended to avoid the friction caused from beginning with the upper lateral teeth.—*A. Chiavaro, Rome, Italy, in Review.*

CLEANSING THE TEETH.

The problem of cleansing the teeth was comparatively simple. The two indispensable ingredients were precipitated chalk and soap. It is necessary to find a soap which would not only act as a lubricant, but should also have a high solvent power for fat, which should be compatible with disinfectants and serve as a medium for binding these together, and which in itself is sterile. It must be expressly manufactured for this purpose.—*N. S. Jenkins, Paris, France, in Review.*

OCCLUSION OF ARTIFICIAL TEETH.

The occlusion is one of the most important things in artificial teeth. I was so unfortunate as to have my upper teeth all knocked out, and I am wearing a plate in the upper jaw. When I had made the occlusion as well as I could by touch paper and the stone, I took carborundum into my mouth and completed it by grinding the carborundum, and I have an occlusion that is just as smooth and just as perfect as the occlusion of the natural teeth.—*G. V. Black, Chicago, Review.*

ORANGE WOOD SPATULAS.

During a discussion on silicate cements, reported in the *Dental Record*, Mr. H. W. Norman recommended for its manipulation orange wood sticks filed down to spatula form. He found them effective, readily cleaned and very cheap.—*American Journal Dental Science.*

AMOUNT OF WATER FOR VULCANIZING.

One ounce of water is sufficient to put in vulcanizer to vulcanize a set of teeth and, strange as it may appear, if the water is measured after vulcanization it will be a drachm more in quantity.—*American Journal Dental Sciences.*

ROOT CANAL TREATMENT.

More than one-half of the pulp canals treated become well in spite of the treatment and not from it. With regard to drilling out canals, personal experience leads to the thought that in certain cases, where it is possible and feasible, it is a wise procedure. In cases where it is not possible I rely upon thorough desiccation and flooding the canal with formol, and vaporizing the formol with hot silver or copper wire. It is the vapor of formol that disinfects.—*G. B. Hayes, Paris, France, in Review.*

PROPER TREATMENT OF ROOTS.

Fixed bridges, or attachments of any kind, are wholly dependent upon the correct treatment of the roots of teeth supporting them. I think that a tooth had better be extracted at once than improperly treated. This is the key to all successful partial restorations, whether removable or fixed, because the removable as well as the fixed is dependent on the condition and permanency of the roots.—*C. N. Thompson, Chicago, in Review.*

PULP EXTIRPATION IN PYORRHETIC TEETH.

About twenty years ago I fully realized the importance of extirpating the pulps of teeth whose sockets were surrounded with pyorrhetic conditions, cleansing and filling their canals to the apex, and amputating the portion of the root which could not be so treated.—*Dr. G. L. Curtis, Digest.*

CLEANING A WAX FORM FOR AN INLAY.

It is a fact that inlays after casting oftentimes have what is called a silicate coating, and it has occurred to me, possibly that was the result of the smearing of saliva on the wax form. For some time I have been washing all these wax forms in water, then in alcohol, and have not yet one case of such coating to report.—*Elliott R. Carpenter, Chicago, American Journal Dental Science.*

SULPHO-CARBOLIC ACID.

I also make use of this drug to aid in removal of pulp nodules and to open up small canals which are closed by dried blood or hardened pulp tissue. I find it does quite as well as sulphuric acid, and does not irritate the tissues in the apical space nearly so badly if a little should accidentally pass through the apical foramen as does the latter preparation.—*Dr. E. MaWhinney, Northwestern.*

TEMPERAMENTS.

The subject of temperaments presents itself to my mind as one of great importance; very little has been written on the subject except by the author. It is generally conceived to be a difficult study, but such is not the case, for it is easy to comprehend, and one can readily be taught to familiarize himself with the subject.—*Dr. G. North, Summary.*

TREATMENT OF PYORRHEA.

The main consideration, however, is the removal of all deposits upon the teeth. If there be necrosed bone, curetttement is necessary, or, if the apex of the root has become resorbed so as to form a needle-like extremity, amputation is desirable.—*Dr. W. H. Whitslar, Cosmos.*

AMALGAM A BOON.

Amalgam is a boon in the cases of children and some nervous patients. It always seems to me wrong in the extreme to exhaust a patient for the sake of an ideal operation.—*Dr. Buttrick, Register.*

SALIVARY CALCULUS.

Very often in mouths where there has been extensive pyorrhea there is a tendency to a rapid accumulation of salivary calculus; this should be frequently removed. I believe that these are among the cases that would receive the greatest benefit from the monthly prophylaxis treatment; where this is not practicable they should receive a cleansing at least every three months.—*Dr. Mary Hartzell, Summary.*

STEW PAN FOR MIXING PLASTER.

Get a small stew pan, of the porcelain-lined variety, with a handle. Mix your plaster in this, and wash under flowing water, when you are through, and before the plaster has set. The cost is about ten or fifteen cents against forty cents for a rubber bowl. By washing immediately it is always clean, and the handle is a convenience to hold it and to hang on a nail.—*Dr. F. B. Spooner, Summary.*

CALCIFICATION AND SALIVA.

It is a commonly accepted fact among dentists that it is the calcification of the tooth that resists the action of the saliva and the bacteria of the mouth. From the experiments I have been carrying on, I must say that I do not believe that the calcification has anything whatever to do with the resisting of that action. If that were the case, why should not the action of an acid be more rapid on a root of a tooth which is exposed in the mouth than on the crown of the tooth, the root having at the very least 10 to 12 per cent less mineral salts than the enamel or the crown?—*Dr. F. M. Wells, Dominion Journal.*

PERSONAL AND GENERAL

Gunn-White.—Dr. John Perry Gunn of Gadsden, Ala., and Miss Clyde White were married November 23.

Smathers-Sullivan.—Dr. Herbert Smathers and Miss Nina Sullivan, of Westminster, S. C., were married there November 18th.

Collins-Gilford.—Dr. D. A. Collins of Marshalltown, Iowa, and Miss Edna Alice Gilford of Platteville, Wis., were married October 15th.

Suicide.—James Lawson Wilson, 33 years old, a well-known dentist of Baltimore, committed suicide by inhaling gas, October 31, 1908.

Knox County Dental Society held a meeting and banquet in Galesburg, Ill., November 21. Dr. Griswold presided and Or. Olson of Galesburg, read a paper.

Appointed Member of State Board.—Dr. J. B. Jordon of Nashville, Tenn., has been appointed a member of the Tennessee State Board to succeed Dr. Jones, who has moved out of the state.

Awarded Damages Against Dentist.—A dentist in Chicago was assessed damages of \$160 for forcibly removing a gold crown from the mouth of a patient because the work had not been paid for.

Dentist's Wife Sues Saloonkeepers.—The wife of a dentist in Chicago has asked \$1,000 damages from a keeper of a saloon because of an accident to her husband in which his leg was broken while he was intoxicated.

Dentist Disappears.—Dr. R. W. Specht of East Orange, N. J., has disappeared, and friends fear for his safety. Dr. Specht left the town and left no word as to his destination and all efforts to locate him have been futile.

Injured by Motorcycle Accident.—Dr. Endicott Smith, a dentist in Boston, Mass., was seriously injured when a tandem motorcycle in which he was riding collided with a carriage. His throat was torn open and an operation was necessary.

Dentist Seriously Injured.—Dr. J. C. Fleming, a dentist in Durand, Wis., was seriously if not fatally burned by an explosion of gasoline. He had entered a storeroom and overturned a can of gasoline, and lighted a match to investigate, when the explosion occurred.

To Prevent Dentistry at Home.—A dentist in St. Louis has been made defendant in a suit to prevent him from practicing his profession at his residence, the plaintiffs claiming a violation of restrictions adopted by those building in the aristocratic neighborhood in which the dentist resides.

Examining Board Affairs.—At the October meeting of the Missouri Board, twelve out of twenty-nine candidates were successful in passing the examination. At the November meeting of the Oregon Board, twenty-three out of twenty-seven applicants were successful.

This Dentist in Demand.—A dentist in Cincinnati is anxiously sought by two women, each of whom claims him as her husband. One woman in Toledo has procured a warrant. The other woman is a resident of Detroit and also claims to have been married to the dentists, who has been employed in a dental parlor in Cincinnati.

Whiteside-Lee County Dental Society held its meeting in Dixon, Ill., December 1st, and elected the following officers for the ensuing year: President, Dr. R. L. Hopkins, Sterling, Ill.; vice-president, Dr. F. E. Morris, Dixon; secretary and treasurer, Dr. C. M. Backus, Dixon. The next meeting will be held in Sterling in March.

Stole \$12,000 Worth of Platinum.—W. Frank Ginkel of Roundtown, Pa., has been placed under bonds of \$2,000 charged with stealing \$12,000 worth of platinum from the Dentists' Supply Company's factory at York, Pa., according to report of chief of detectives. The prisoner has confessed and \$5,000 worth of platinum has been recovered.

Warren County Dental Society held its annual meeting at Monmouth, Ill. A banquet was served, after which election of officers was held, resulting as follows: President, Dr. O. M. Daymude, Monmouth; vice-president and librarian, Dr. A. W. Glass, Monmouth; secretary, Dr. H. W. McMillan, Roseville; Treasurer, Dr. W. S. Phelps, Monmouth.

Fatalities.—G. A. Quayle, a retired merchant of Morristown, N. J., died in the office of a New York dentist while under the influence of gas, October 16, 1908. Heart disease was the inducing cause.—Richard Martin, a young man of Calais, Vt., died in a dentist's chair in North Montpelier, October 20, 1908. Chloroform had been given, and he failed to revive from its effects.—Frank Jenocek, 23 years old, of Mt. Taber, Wis., died from blood poisoning caused by an abscessed tooth, November 13, 1908.

Dentists for Panama Canal Men.—With the arrival of the Panama liner *Allianca* it was learned yesterday that the Isthmian Canal Commission would have two dentists to care for the teeth of its employes. O. N. Reubens, who arrived on the *Allianca*, said he and another dentist had been appointed and would have quarters at Gorgona and Culebra. Two dentists who practiced in the canal zone were not under the jurisdiction of the commission and were able to charge whatever they chose. The new men will have to regulate their charges according to a scale fixed by the Isthmian Canal Commission. Mr. Reubens will purchase dental supplies in this city and return to the Isthmus within a few weeks.—*New York Tribune*.

Extracts Nine Teeth for One.—Unable to reach a dental office, and suffering untold torture from an aching tooth, James Ridley, residing in a remote part of the farming district, himself extracted nine teeth with a pair of pincers before he secured the right one. Ridley, for a green-horn, made a fairly good job of it, but his gums were badly swollen and bleeding.—Philadelphia Record.

Copper Country Dental Society.—The first regular meeting of this new society was held at Houghton, Mich., December 14. Dr. R. P. Niel of Calumet read a paper on "Removable Bridge Work," and Dr. A. G. Coggin of Lake Linden one on "Cast Inlay Work." The next meeting will be held at Calumet, when members of the society will be the guests of Dr. R. D. Jones at the Miscowaubik Club.

Circular to Soldiers in Philippines.—The following recommendations of the Dental Surgeon in reference to the care of teeth are published for the information of all concerned: "Each man should be provided with tooth brush, tooth powder (Lyons' tooth powder, sold in Commissary, very good), Listerine, one bottle. The teeth should be cleaned after each meal; especially is this necessary after the evening meal. If the teeth are neglected at night the particles of food from the last meal remain in the teeth for twelve hours, decaying and becoming putrid.

"Wet the brush in water, put plenty of tooth powder on the brush, then brush the teeth upward and downward, using a rotary motion, so that the bristles will get in between the teeth. After the teeth have been cleaned, rinse the mouth with equal parts of Listerine and water. If Listerine is not obtainable, use water alone.

"CLEAN TEETH DON'T DECAY."

"This circular will be read to the enlisted men of each organization at the first retreat formation after its receipt."

By order of Captain Seay.

H. A. Drum, Captain and Adjutant, 23d Infantry, Adjutant.—John A. McAlister, Jr., Army Dental Surgeon.—Digest.

Illegal Practitioners.—A dentist of Toledo, Ohio, was fined \$50 and costs, October 14, for practicing dentistry without a license.—A dentist of Bowling Green, Ohio, arrested recently for allowing an unlicensed dentist to prepare teeth of a patient for crowning, was acquitted by a jury, October 20. Later he was again arrested on the same charge, on an affidavit sworn out by the Secretary of State Board.—A case against a dentist of Ogden, Utah, for practicing without a license, for which he was recently adjudged guilty, is the seventh prosecution brought against him by the State Dental Board since he began practicing in that city.—Another dentist of Ogden, Utah, under indictment for practicing without a license, was arrested in Salt Lake City, at the instigation of his bonds-men, and will be returned to that city. Anticipating that he would not return for trial, the sureties withdrew from the bond, and his rearrest

was ordered.—A dentist of Spokane, Wash., was fined \$50 and costs for practicing without a license, October 16.—A dentist of Denver, Colo., arrested for practicing without a license, has been released. Bond was fixed at \$100.—October 17, a dentist of San Francisco, arrested on the same charge, was sentenced to pay a fine of \$50, with the alternative of 50 days in the county jail.—Digest.

Robberies.—Dr. S. H. Walton, Mishawaka, Ind.; loss, \$50. Anna Doan, Mishawaka, Ind.; loss, \$50. J. H. Schlecht, Carthage, Mo.; loss, \$40; C. B. Pollard, Carthage, Mo.; loss, \$12. Smith & McKee and W. F. Maury, Wheeling, W. Va.; loss not given; Drs. Potter, Corbiere and Shepard, Redding, Cal.; gold valued at \$200, October 5. Dr. M. R. Grandits, San Francisco; gold valued at \$15, October 12. Drs. Thayer and Harriman, Pontiac, Ill.; gold valued at \$34, November 6. Offices of eight dentists of Fort Wayne, Ind., visited recently, and gold valued at \$400 taken. Dr. E. E. Paxson, South Bend, Ind.; gold valued at \$25, October 31. Dr. F. G. Blackburn, Shelbyville, Ind., gold valued at \$20, November 6. Drs. Cole & Porter, Iola, Kans.; gold valued at \$30, October 23. Dr. Laura Fritzgartner, Wichita, Kan.; gold valued at \$20; Dr. G. C. Ferguson, Brooklyn, N. Y.; instruments valued at \$100, October 27. Dr. O. W. Norton, Rochester, N. Y., gold valued at \$50, November 5. Drs. A. R. Hengst & Corzilius, Columbus, Ohio; gold valued at \$100, October 14.

NECROLOGICAL.

Dr. John C. Allen died at his residence in Cincinnati, December 31. He was 75 years old and had practiced in that city for 25 years.

Dr. William A. Root, a dentist in Sacramento, Cal., died November 19th. He had been in ill health for two months from kidney trouble.

Dr. E. F. Earhart, a dentist in Indianapolis, Ind., died November 27, after an illness of two years. He had practiced in Indianapolis thirty-three years.

Dr. Rudolph F. Hass, a dentist in New York City, died on his wife's grave from swallowing prussic acid. He was 35 years old. He had been married but a short time and his wife had committed suicide a few days earlier.

Dr. Geo. W. Covert, a dentist at Long Beach, Cal., and formerly at Franklin, Ind., died at the former place December 16. He had practiced for thirty-three years.

Dr. Walter Franklin Fundenberg, a dentist who formerly practiced dentistry in Pittsburg, Pa., died November 22d at the age of 81. He had served as surgeon in the Civil War.



DENTAL PATENTS

Fig. 1.

879,254. Manually-Controlled Dental Engine. Jean L. Gauthier, Washington, D. C. Filed May 18, 1907. Serial No. 374,364. 1. In an engine of the class described, the combination with a drill shaft, a balance wheel on said shaft and a pinion fixed to said shaft; of a driving gear adapted to mesh with said pinion, a ratchet wheel, a pawl pivotally secured to said driving gear one end of which is adapted to engage the ratchet wheel, whereby the driving gear will be given a rotating movement, while the rotation of the ratchet wheel is intermittent, a pinion fixed to said ratchet and means to intermittently rotate said pinion and ratchet, whereby the drill shaft will be operated.

Fig. 2.

900,812. Dental Blower. Percy E. Williams, Savannah, Ga. Filed May 7, 1907. Serial No. 372,380. 1. A blower comprising a frame, a pair of spaced opposed aligned compressor cylinders having open inner ends and outer end heads, a connecting web between said cylinders having an upwardly extending side supporting flange, said cylinders formed from a tube having its intermediate portion between the cylinders open at the front and top and forming said web and supporting flange, means securing said flange to the frame to support the cylinders, pistons in said cylinders having piston rods, a rotary shaft carried by said means, and operating connections between said shaft and rods to reciprocate said pistons, substantially as described.

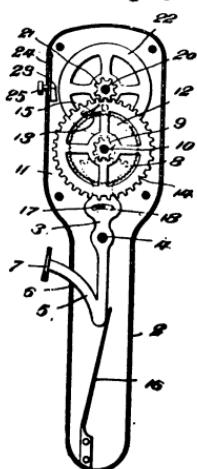
Fig. 3.

888,455. Dental Plugger. Arthur Atkiss and David C. Carson, Philadelphia, Pa. Filed October 17, 1907. Serial No. 397,812. 1. In a dental plugger the combination with a handle having an offset frame, a casing connected with said frame and lying in a plane parallel with said handle, a shaft mounted in said handle adapted to be operatively connected with a motor, a gear mounted on the inner end of said shaft, a second gear provided with a bearing pin on one face and having a cam face on the other face mounted within the offset frame and meshing with the gear on said shaft; of a longitudinally movable tool holding plunger mounted in said casing and having a cam face at its inner end adapted to contact with the cam on said gear, a spring mounted on the plunger within said casing arranged and adapted to force said plunger inwardly, a plate mounted on the plunger and movable in said casing, and means for moving said plate longitudinally of the same.

Fig. 4.

902,462. Method of Treating Teeth for Filling. Frank Armstrong, Dunedin, New Zealand. Filed Feb. 8, 1907. Serial No. 356,345. Method of treating teeth which consists in making a suitable solution, heating the solution, spraying the solution on the tooth under operation, regulating the heat of the solution, preventing the solution from touching the inside of the mouth of the patient, and draining the solution away substantially as described.

FIG 1



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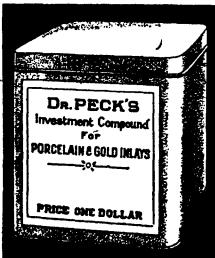


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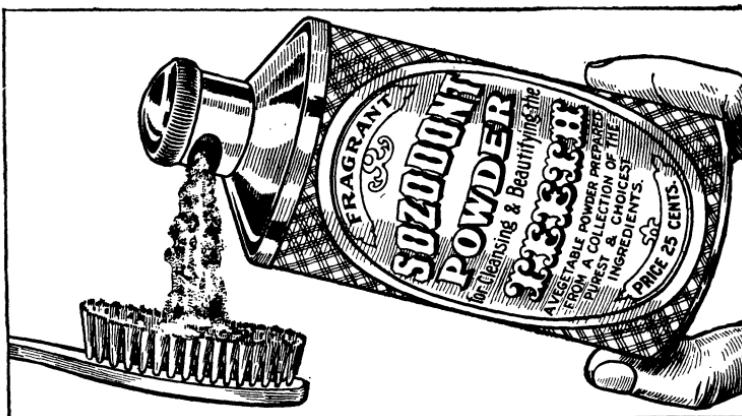
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November, 1908.

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